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BrewYour Own

THE HOW-TO HOMEBREW BEER MAGAZINE

OCTOBER 2021, VOL.27, NO.6

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Brew Your Own
THE HOW-TO HOMEBREW BEER MAGAZINE

departments

where to find it

RECIPE INDEX

RECIPE STANDARDIZATION

EXTRACT EFFICIENCY: 65%
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one 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.

Brew Your Own — THE HOW-TO HOMEBREW BEER MAGAZINE

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Cover Photo Illustration:
Charles A. Parker/Images Plus

Q Do you have a favorite fall-time beer?

I'm an IPA gal through and through. I like them fresh, juicy, and bursting with New World hop character. There are a few hoppy amber ales that show up during the fall that I love. Here in New England Harpoon's Flannel Friday is one such example of this type of beer that I love to sip on during one of those crisp fall evenings around a fire pit in our backyard.

I can't imagine the transformation of color and beauty of autumn without thinking about the hop harvest in Yakima, so my natural choice for a fall favorite style is a fresh/wet-hopped beer. Fall is my Hops Christmas, and I get honest-to-goodness butterflies in my stomach when the first batch of Sierra Nevada's Celebration hits the shelves.

That's easy! Oktoberfest. Paulaner O-fest was one of my vectors into the world of beer.

Volume 27, Number 6: October 2021

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Open Fermentation Tips

Before the days of airlocks and cylindroconicals, open fermenters were the only way to go. These days, however, despite all the modern methods, some brewers believe that the old way is still the best way. Get some advice from brewers at Anchor, Sierra Nevada, and Jolly Pumpkin about this time-honored technique. https://byo.com/article/open-fermentation-tips-from-the-pros-2/

MEMBERS ONLY

Pumpkin Beer Tips & Clones

There are really at least three broad levels of complexity when crafting a pumpkin beer: The base beer, the pumpkin, and the spicing. Get some tips and clone recipes from some of the top brewers of this style of beer in each of these categories. https://byo.com/article/pumpkin-beer-techniques/

Piwo Grodziskie

Piwo Grodziskie, a historic smoked beer style also known as "Gratzer" or "Polish Champagne," is a low-alcohol, highly-carbonated, refreshingly light-bodied wheat ale that has an oak-smoked flavor melded with a clean hop bitterness. Learn more more about the style. https://byo.com/article/piwo-grodziskie/

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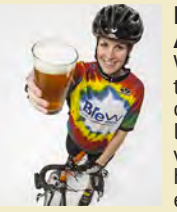

Hold The Alcohol

With the growing trend in non-alcoholic and low-alcohol beer, we take a look at how homebrewers can create these beers at home without the expensive equipment used in most commercial settings. https://byo.com/article/hold-the-alcohol/

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SEND IN THE CLONES!

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Enjoy the ultimate collection of our clone recipes, complete with full-color photography. This book contains both the classics and newer recipes from top craft breweries including Brooklyn Brewery, Deschutes, Firestone Walker, Hill Farmstead, Jolly Pumpkin, Modern Times, Maine Beer Company, Stone Brewing Co., Surly, Three Floyds, Tröegs and many more.

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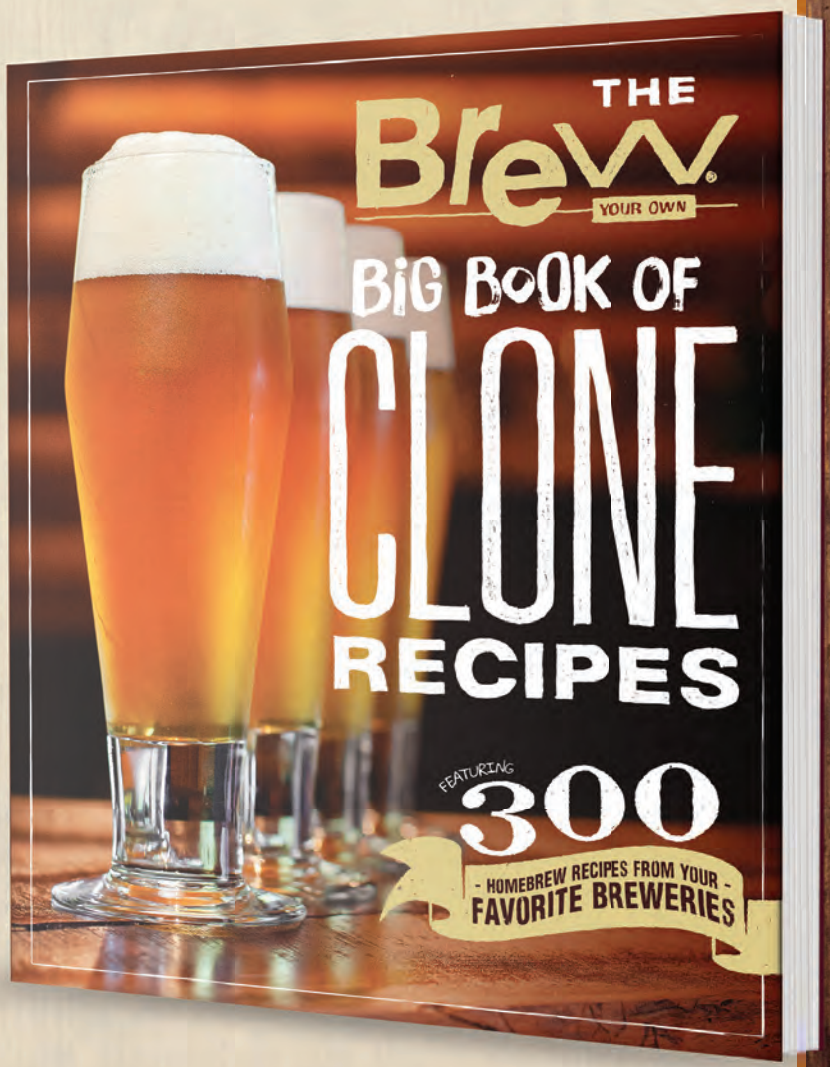

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BrewW YOUR OWN THE HOW-TO HOMEBREW BEER MAGAZINE

MAIL

IBUS FROM LATE HOP ADDITIONS

Is there a reason why there are no alpha acids mentioned for the 5-minute additions of Hersbrucker and Saaz in the Birrificio Italiano Tipopils clone recipe from the July-August 2021 issue?

Andreas Taubmann • *via email*

BYO *Recipe Editor Dave Green responds: "It's a fairly subjective thing, but basically at this point in the boil when using such low alpha acid hops like Saaz and Hersbrucker, alpha acids and the conversion to iso form is pretty negligible. We're talking about roughly 1 IBU here, so it really doesn't make much sense to worry about a 0.4 IBU variation depending on these hops' alpha acid concentration. In other words, we care a lot more about these two hops' oils at this point in the game.*

"Now, if the hops we were using were 16% alpha acids and we were doing a long whirlpool phase where bitterness levels could be greatly affected by variations in the alpha acids, then yes, we would most definitely be adding the alpha acid units. I hope that clarifies things."

ITALIAN PILS WATER PROFILE

I loved the "Italian PIls" article in the July-August 2021 edition. I plan on brewing it this weekend. Do you have a suggested water profile or recommended salt additions for this beer?

David Scheil • *via email*

Story author Horst Dornbusch responds: "As far as water is concerned I would not worry too much. After all, unlike such classic styles as Czech Pilsner, Munich helles, Vienna lager, Dortmunder export, or Burton pale ale, each with distinct local water characteristics, the Italian Pilsner, born in Milan, is brand new. There really is no binding dogma about the water composition.

"Considering the beer is now being brewed almost everywhere with different local (often municipal) waters, from Paso Robles to Salt Lake City to Kittery and Portland, Maine, you should be able to make the beer with just your water, untreated.

"Thomas Kraus-Weyermann and I brewed the beer in Bamberg, Germany, which has a natural water profile similar to that of Munich. And as you can tell from the sensory evaluations included in

contributors

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

On page 32 Stephen shares how homebrewers can estimate the calories and carbohydrates in their beers.

Aaron Hyde began homebrewing in 1996 with his father in the kitchen. From there he picked up home distilling in 2008, piecing together a still from an old keg and copper piping. He now manages global product strategy for Bevie, providing equipment and ingredients to homebrewers and distillers across the globe. He often consults on home still design and development, as well as distilling-related products and accessories. Aaron is one of the few people globally who has received certifications in brewing, malting, and distilling through the Institute of Brewing & Distilling. Aaron formerly authored *BYO*'s "Techniques" column and continues to write features for *BYO*. In 2021 he authored *How to Distill* for the hobby distiller and manages the website www.howtodistill.com, which provides supplementary information and support to the book.

Fresh off getting his first book published, Aaron shares an adapted excerpt from *How To Distill* starting on page 38.

Gordon Strong is the President and highest-ranking judge of the Beer Judge Certification Program (BJCP), the organization that certifies beer judges for homebrew competitions and also registers qualifying homebrew competitions. In addition to his Grand Master Level V judge status, Gordon is a three-time winner of the National Homebrew Competition Ninkasi Award and the author of homebrewing books *Brewing Better Beer* and *Modern Homebrew Recipes*. He has been *BYO*'s "Style Profile" columnist since 2015 and is a frequent feature story author. He's also a regular speaker at *BYO* events, including the upcoming BYO Boot Camp November 4–6 in Denver, Colorado, where he will lead two "Advanced All-Grain Techniques" full-day classes.

In this issue, Gordon does double duty with a feature on brewing with pumpkins and other gourds (page 60) and his "Style Profile" column on Czech dark lager (page 24).

MAIL

the story, the result tasted great.

"Water profiles of famous brewing cities are available online. Just pick any city and brew the beer. Munich would be a good choice, but if you feel adventurous, you can pick two opposites, brew the beer twice, and taste the difference. The rest depends on your subjective preference. Just remember — soft water suppresses hop bitterness perception, while hard water accentuates it."

HOW'D YOU DO THAT?

I am left scratching my head about one facet in the article "A DIY Worth a Closer Look" by Adam Wirth in the March-April 2021 issue. It was a fantastic article and should inspire any homebrewer with a usable out-building to pursue greater things for their homebreweries. I have a fairly decent operation in my out-building but not on a level with Mr. Wirth's. I'm in the process of upgrading my grain mill from a hand-cranked two-roller mill to a Maltmuncher 3 roller mill with a matching high torque motor. The standard kitchen island solution for mounting the mill Mr. Wirth describes in the "Grain Mill" section of his article seems to be the perfect solution for me. I've searched all the major home centers trying to find a two-door unit that matches the one shown in the article. It didn't take me long to find out all these units have a drawer at the top, which would block the grain from falling into the bucket. I examined Mr. Wirth's picture a little closer and can see a drawer at the very bottom of the unit. I'm assuming he intentionally assembled the unit upside down with the casters on top of the unit and the cutting board at the bottom, and then half turned and swapped the doors so the handles would be in the right place? Is that right?

Ben Livesay • *via email*

Story author Adam Wirth responds: "Glad to hear you liked my grain mill. And might I say, good eye on the shelf! You are correct in that the kitchen islands for use on this project will all have a shelf at the top. I knew the shelf would have to move, but I still wanted to use it for storage. Instead of flipping the island upside down, I simply removed the doors, shelf, and drawer, then reattached them in the configuration I wanted. The doors have two screws per hinge, and the drawer has two screws for each slider. With the sides being pre-finished wood, it was a quick job to remove, mark the new location, and drill new holes. That's it!"

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.

BEGINNER'S BLOCK

BY DAVE GREEN

FORCED CARBONATION

There are generally three ways that brewers can carbonate their beverage: Bottle conditioning, spunding, and forced carbonation. There is another, more advanced technique out there called kräusening (see Mr. Wizard to read more on that), but most every brewer uses one of those three techniques. If you're looking to learn more on bottle conditioning, check out: https://byo.com/article/priming-with-sugar/. For more on spunding visit: https://byo.com/article/advanced-brewing-9/. But in this piece we're talking about forced carbonation, which relies on an outside source of carbon dioxide to push the gas into solution.

Forced carbonation should be done in an appropriate pressure-rated vessel (as should all carbonation techniques). Corny kegs are the perfect containers to force carbonate your beverages since they are capable of handling high pressures. But nowadays there are also stainless steel conical fermenters available to homebrewers that are pressure-rated so homebrewers can force carbonate prior to packaging/kegging their beer (please note that the use of a spunding valve is highly recommended when filling Corny kegs with a carbonated beer from a pressurized tank). Once the beer is force carbonated, brewers then have the option of either serving on draft or bottling the beer using a counter-pressure filler.

Homebrewers need a couple pieces of specialty equipment to force carbonate. First is a vessel to carbonate in; as mentioned Corny kegs are the perfect container for this. Second is a tank of carbon dioxide with a good regulator. Carbon dioxide tanks are found in various sizes with the 5-lb. (2.3-kg) tank the most popular for homebrewers. You can source these from many homebrew shops or gas suppliers. When it comes to regulators, I'm a proponent of the "buy once, cry once" mentality as cheap-o regulators do and will fail. Also you do need to purchase a regulator specific to carbon dioxide.

SPEAKING VOLUMES

A tool everyone who force carbonates their beverages should have is a carbonation chart: https://byo.com/article/master-the-action-carbonation/. The chart dictates the fact that the carbonation level you are looking to achieve in your beer (or other beverage) is controlled by two factors: Liquid temperature and pressure in the container. Most brewers will use the term "volumes of CO_2" when talking about the carbonation level in their beer. What this term "volumes" refers to is how much space the gas would take up under normal atmospheric pressure. For example, the gas in a 5-gallon (19-L) Corny keg with 2 volumes of CO_2 would expand to 10 gallons (38 L) if the equivalent gas were collected in a large balloon.

Most often homebrewers will force carbonate at refrigeration temperatures. But there are many times when the kegerator may not have room or the brewer is carbonating in a stainless conical, where temperatures may be quite a bit warmer. The warmer the temperature, the more pressure that is needed to achieve the same volumes of gas (think back to science class … cold gasses are much more dense than warmer gasses). Modern beers are often carbonated in the 2.0–2.5 volumes CO_2 range. So to carbonate a beer to 2.4 volumes of CO_2, you need to set your regulated pressure to 11 psi at 40 °F (4 °C), but need to crank it up to 27 psi to get the same carbonation level at 65 °F (18 °C). If you subsequently cool the fully carbonated beer from 65 °F (18 °C) down to 40 °F (4 °C) though, the carbonation level will not change (so long as no more CO_2 is administered).

FORCES AT PLAY

The speed at which you force carbonate is something that can be toyed with. On one end of the spectrum is the "set and forget it" method. In this scenario the brewer hooks up their gas to their filled Corny keg and adjusts the regulated pressure to the level desired to obtain a certain level of carbonation . . . then waits. I have found that roughly two weeks are required to carbonate a full Corny keg. This is a great method for those with an abundance of beer already on tap or in queue . . . or for patient brewers.

To speed things up, there are two decent alternatives. First is the burst carbonation technique. The basic idea is a short period (usually 24–36 hours) at an elevated pressure (say ~30 psi) to get the beer most of the way to fully carbonated, then the regulator is turned down to what the regulator should be set at and the final push to fully carbonate the beer takes another 1–3 days. Another method is to get a carbonation stone. These carbonation stones greatly speed up the time to get the gas diffused into the beer.

BRING BALANCE TO THE FORCE

Once you have chosen an appropriate carbonation level for the beer, the final step in this equation is selecting a serving pressure. The serving pressure is 100% dependent upon the lines and faucets you are moving your beer through. Longer, narrower, more resistant lines require higher serving pressures, while shorter, wider-diameter, less resistant lines require lower pressure. Learn more about this concept here: https://byo.com/article/balancing-your-draft-system-advanced-brewing/. The ideal situation is to have the serving pressure match the forced carbonation pressure. This minimizes foaming issues or slow pours.

BYO READER PROJECT

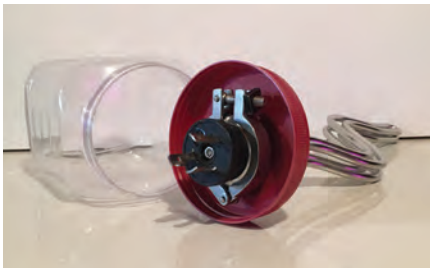
EZ SCRUB CLEANER

GARY SCHWARTZ • KELOWNA, BRITISH COLUMBIA

I have been brewing on an all-electric system for quite a while and cleaning the stainless steel heating element has remained troublesome. The baked on residue was hard to get off. I tried many things to make cleaning the element easy and effective and all were what I considered failures since I wanted the element shining like new. But the combination of failures led to a simple, cheap, no-hand-scrubbing solution.

In the beginning, I tried soaking the element in a hot PBW solution in a tall narrow container and then used assorted brushes to scrub it. I imagine many electric brewers are still doing this and I did it quite a few times. This was difficult, time-consuming, and had less than perfect results.

I then built an enclosure to protect the electrical connections on my tri-clamp element and ran it through the dishwasher. The enclosure was just a large empty plastic food container with a screw on lid (see picture below). I used a bolt-on tri-clamp fitting on the lid of the enclosure. This was a total failure since the enclosure leaked a bit because the lid didn't seal well and the element didn't come very clean anyway.



EZ Scrub System version 1

Next, I thought it would be clever to build an ultrasonic cleaner using parts ordered off the internet. The ultrasonic transducer and driver circuit board are surprisingly inexpensive. Ultrasonic cleaners use a transducer that converts electrical energy into high frequency mechanical vibrations. The vibrations are transferred into the cleaning solution where they create cavitation bubbles on the object thereby cleaning it. I tried a system running at 40 kHz and rated at 60 Watts.

EZ Scrub Cleaner version 2

I epoxied the ultrasonic transducer to a stainless container (sold as a vase) and connected the diver circuit board (see picture above). I also added extra sealant around the solder on the base of the vase. However, the vase was not well matched to the transducer for power transfer. I think the area of the base of the vase was too small to vibrate enough to transfer the energy properly. This resulted in little transducer energy being transferred into the hot PBW solution in the container. Most of the energy was reflected back into the transducer making it HOT!

I combined the knowledge gained from previous failures into a system that actually works with no scrubbing by hand! By using a hot PBW solution, a suitable tall container, and an aeration wand with an aquarium air pump running, the hard to remove baked-on film on the stainless heating elements slides off by itself after about 30 minutes. The bubbles seem to do all the work. I just do a bit of rinsing at the end to get it all off. The idea to try the aeration wand came from the ultrasonic cleaner failure. Even the wand gets a cleaning in the hot PBW as a bonus and other small items such as dip tubes can also get simultaneously cleaned in the process.

Photos by Gary Schwartz

Above: The final version of the EZ Scrub System. Below: Before and after pictures.

WHAT'S NEW

DRY RUN PROTECTION ON BLICHMANN RIPTIDE™ PUMPS

Brewers who utilize pumps in their brewhouse often fear that noise; the high-pitch screeching noise when the pump loses prime and the pumphead runs dry. It can melt and warp the impeller head, seizing the pump if left on too long. This can also damage performance if left dry in shorter stints. Blichmann Engineering now offers dry run protection on all of its RipTide™ pump models. This new version utilizes a carbon fiber impeller that can withstand the intense heat caused by having the pumphead dry while the impeller is spinning. Due to supply chain issues, these impellers are only available in new pumps, but Blichmann Engineering does plan to sell them as an upgrade in the future. Learn more at https://www.blichmannengineering.com/riptide-brewing-pump.html

SAFCIDER YEAST

Fermentis has announced a new line of yeast strains geared specifically for cidermakers. There are many different ways to produce a cider across the globe and there are many cidermakers who want to innovate and create a new style of cider to feed diversity in this cider world. Different cider styles require different technical demands on the yeast when picking a yeast strain for your cider. To make this selection process easier for the cidermaker, Fermentis has created four new cider strains to obtain the cider profile they desire. SafCider AB-1 for balanced ciders, SafCider AC-4 for fresh and crisp cider, SafCider AS-2 to bring sweetness to your cider, and SafCider TF-6 to maximize the fruitiness of your ciders. These strains are available in 5-g sachets for cider production at home. To discover more visit www.fermentis.com

Photo courtesy of Evan Craine/Washington State University

UNTRAINED BEER TASTERS CAN DISTINGUISH DIFFERENT BARLEY TYPES

Researchers at Washington State University set about to test four new breeds of barley that they developed by gathering a large group of beer drinkers to taste SMaSH (single malt and single hop) beers brewed using those four new barley strains. They compared the new varietals against a beer with the high-quality and popular Copeland strain of barley. While the trained beer drinkers were easily able to distinguish between the five beers, what surprised researchers most was that even a large group of untrained beer drinkers could distinguish the differences. Some beers contained "fruity and sweet aromatic" flavors while another one had "citrus" qualities according to panelists. They found that tasters preferred the newer varietals more than the Copeland. Keep your eyes out for news about the release of these new varietals from maltsters. https://news.wsu.edu/2021/07/20/untrained-beer-drinkers-can-taste-different-barley-genotypes/

Upcoming Events

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BYO REPLICATOR

BY DAVE CLARK

DEAR REPLICATOR, My wife and I are finally empty nesters and we decided to celebrate by taking a trip to Hawaii to do some island hopping for a month since neither of us have ever been there. We found the Big Island to be so facinating both geologically, ecologically . . . and we discovered an amazing brewery! While in Waimea we stumbled on Big Island Brewhaus, which provided not only great beer, but also great food. I loved the balance found in the Golden Sabbath most of all. Would love to replicate this one back at home and reminisce about the trip with my wife.

Ken Greenberg
Encinitas, California

Named after the Hawaiian island where it resides, Big Island Brewhaus features an array of styles. Thomas Kerns, both Co-Owner and Brewmaster at Big Island, has had the "golden" opportunity to travel and experience various brewing regions around the world. Kerns has channeled that knowledge into his beers, which reflect Kerns' European travels. Traditional American craft staples such as IPA, pale ale, and nut brown headline their tap list, while European styles such as lagers, Gose, Baltic porter, and an assortment of Belgian-style offerings round out the lineup. Among these are grisette, dark strong, and this article's featured beer: Golden Sabbath, a Belgian-style abbey ale.

Kerns and his wife, Jayne, have built their brewery centered around the Hawaiian term *ohana*, which means "family." The Kerns' have created a family atmosphere that drives everything they do at Big Island Brewhaus.

Kerns' beer journey started during his travels to Europe and escalated as he began to homebrew. "I became inspired by what beer is and how regional it seemed," said Kerns. "That, coupled with my love of food and the way the flavors of food and beer interact with each other — it's become a lifelong passion."

After studying history and music at Portland State University, Kerns searched for a brewing job. Hired by McMenamin's of Oregon in 1993, Kerns started at the bottom. He understood he could learn everything about professional brewing from the ground up. Kerns spent three years with McMenamin's, eventually running several of their breweries.

From there, Kerns was hired to open a brewery in the Philippines in 1995. He left McMenamin's, moved to Manila where he designed, set up, and opened a brewery. "It was a great opportunity to do it on my own," said Kerns.

After successfully launching the brewery in the Philippines, Kerns returned to Maui, Hawaii where he once lived, to join forces with a restaurateur who was looking to create and open a brewpub. Fish and Games Brewing Company officially opened in 1998. Kerns ran the brewery through 2005 when the company was purchased by Garrett Marrero. Kerns and Marrero worked together for three years building the brand, which became known as Maui Brewing Company under Marrero's ownership. Having successfully run or launched breweries for several different companies, it was time for Kerns to do it on his own.

Tom and Jayne Kerns' vision came to life on March 4, 2011 when Big Island Brewhaus served its first beers, Paniolo Pale Ale and Malama Helles Lager. Besides the idyllic setting, brewing in Hawaii has its advantages.

"Brewing in Hawaii creates a natural isolation, which is good for our business and our culture," said Kerns. "Being on an island, all the different flavors that come with Hawaii and Hawaiian cuisine make their way into the scene, onto the table, and into the beer."

The goal in all of Kerns' beers is to create harmony, where all the ingredients work together to create a wonderful aromatic and flavor experience. That harmony is especially evident in Golden Sabbath, their Belgian-style abbey ale.

Besides the obvious connotation to monk brewers and/or the band Black Sabbath, Kerns' inspiration for the name actually came during a beer judging with a renowned Belgian brewer at the World Beer Cup in 2010.

"I was judging Belgian beers with Hildegard van Ostaden, a renowned brewer from Belgium's Urthel Brewery," said Kerns. "She spoke fondly of 'Sabbath' beers; strong, rich ales that were often savored on Sunday afternoons, to thoroughly enjoy the Sabbath."

Stylistically, Golden Sabbath can be considered a slightly fuller-bodied Belgian golden strong ale. The use of local Hawaiian honey in place of traditional Belgian candi sugar provides body, a silky texture, and an inviting aroma.

Hopped with a blend of European and subtle American hops, this drinkable beer packs a punch at 8.5% ABV. It has also shown its strength during competition as a three-time medalist at the U.S. Open Beer Championships in addition to winning medals at both the World Beer Cup and the Great American Beer Festival in 2014.

Munich malt provides a subtle toasty character while the 45 IBUs and the effervescent carbonation adds to the beer's character, providing a crisp, clean finish. Golden Sabbath pairs exquisitely with seafood dishes, especially fresh fish, lobster, and crab. The yeast adds a unique, yet restrained, caramel-apple nuance, which lets the honey shine through.

Now you can take a virtual Hawaiian vacation by brewing your own version of Golden Sabbath. Listening to Ozzy while doing so is entirely optional, but strongly encouraged.

BIG ISLAND BREWHAUS' GOLDEN SABBATH CLONE

(5 gallons/19 L, all-grain)
OG = 1.074 FG = 1.009
IBU = 45 SRM = 7 ABV = 8.5%

INGREDIENTS

11 lbs. (5 kg) North American 2-row pale malt
2 lbs. (0.91 kg) Great Western Munich malt (10 °L)
0.5 lb. (227 g) Simpsons caramalt (15 °L)
1 lb. (0.45 kg) macadamia nut honey or mesquite honey
0.42 lb. (190 g) cane sugar
7.15 AAU Galena hops (90 min.) (0.55 oz./16 g at 13% alpha acids)
4.5 AAU Hallertau Mittelfrüh hops (30 min.) (1 oz./28 g at 4.5% alpha acids)
4 AAU Tettnanger hops (0 min.) (1 oz./28 g at 4% alpha acids)
White Labs WLP570 (Belgian Golden Ale), Wyeast 1388 (Belgian Strong Ale), Imperial Yeast B51 (Workhorse), or Mangrove Jack's M31 (Belgian Tripel) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Employing a single infusion mash, target a mash temperature of 152 °F (67 °C), rest for 60 minutes or until conversion is complete. Recirculate until clear, then collect wort and boil for 90 minutes. Add first hop addition when boil is achieved, second addition with 30 minutes remaining, sugar with 15 minutes to go, and final hop addition and honey after heat has been turned off. Adding honey during whirlpool helps to retain much of its valued aroma. Give the wort a long stir to create a whirlpool, then let settle for 20 minutes before beginning to chill the wort.

Chill wort to 68 °F (20 °C), pitch yeast, and oxygenate. A big beer like this can take 12–15 days to finish primary fermentation. Maintain a temperature of 68 °F (20 °C) to help maintain a restrained ester profile, while still imparting an overall positive yeast character.

BIG ISLAND BREWHAUS' GOLDEN SABBATH CLONE

(5 gallons/19 L, extract with grains)
OG = 1.074 FG = 1.009
IBU = 45 SRM = 8 ABV = 8.5%

INGREDIENTS

5.8 lbs. (2.6 kg) light or golden light dried malt extract
1 lb. (0.45 kg) Munich dried malt extract
0.5 lb. (227 g) Simpsons caramalt (15 °L)
1 lb. (0.45 kg) macadamia nut honey or mesquite honey
0.42 lb. (190 g) cane sugar
7.15 AAU Galena hops (90 min.) (0.55 oz./16 g at 13% alpha acids)
4.5 AAU Hallertau Mittelfrüh hops (30 min.) (1 oz./28 g at 4.5% alpha acids)
4 AAU Tettnanger hops (0 min.) (1 oz./28 g at 4% alpha acids)
White Labs WLP570 (Belgian Golden Ale), Wyeast 1388 (Belgian Strong Ale), Imperial Yeast B51 (Workhorse), or Mangrove Jack's M31 (Belgian Tripel) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Raise 2 gallons (7.6 L) of water to about 152 °F (67 °C) and steep only the caramalt (in a muslin bag) for about 10 minutes. Remove grain, letting the liquid drip back into the pot without squeezing. Remove malt and raise temperature to near boiling. When close, remove from heat source and slowly stir in the dried malt extract, ensuring it is fully dissolved. Place back onto heat source and raise to a boil. Add first hop addition when boil is achieved, second addition with 30 minutes remaining, sugar with 15 minutes to go, and final hop addition in whirlpool. Add honey during whirlpool to get a thorough blend, while retaining much of its aroma.

After a 20-minute kettle rest, chill wort to 68 °F (20 °C) and top up with pre-boiled and chilled water to achieve a total of 5 gallons (19 L). Pitch yeast, and oxygenate. A big beer like this can take 12–15 days to finish primary fermentation. Maintain a temperature of 68 °F (20 °C) to help restrain the ester profile, but still impart positive yeast character.

TIPS FOR SUCCESS:

The goal for Golden Sabbath is to achieve a dry finish while showing light honey/caramel/apple nuances with a floral citrus hop accent. According to Kerns, specific malts make all the difference when trying to recreate this beer.

"I recommend a good 2-row to give a solid backbone instead of using a lighter-bodied Pilsner malt," said Kerns. "Also, I recommend using the Great Western Munich for this beer over the European varieties of Munich malt. Great Western imparts more of a dry-toasty character versus the malt sweetness you get from typical German varieties of Munich malt."

The honey you select will be a key part in developing the final nose and flavor of the beer. But sourcing the nutty tasting macadamia nut honey isn't going to be easy (or cheap) since the Big Island is the main production site of this honey. Mesquite honey from the desert southwestern U.S. is a good alternative with its light molasses character.

Dextrose can be used instead of cane sugar and Citra® hops can be used in place of Galena; brewer's choice. The sugar or dextrose is used to lighten the body of the beer while adding fermentables. Your SRM may differ from the recipe (can range from 7–12), depending on the type of honey used and/or employing different maltsters for the grain bill. BYO

BY DAWSON RASPUZZI

PASTRY STOUTS

Brewing dessert in a glass

So-called "pastry" stouts are loaded with flavors reminiscent of popular desserts and commercial examples have become some of the most sought-after beers. Get tips for brewing these rich beers from three of the best, who each approach them differently.

For me, a "pastry" stout is just a sweet stout with either some lactose or maltodextrin for extra body, and adjuncts to mimic a certain type of dessert. They are fun beers to drink and share with friends. The most important thing when brewing them is a solid base recipe. I like 70% base malt with 30% specialty and either lactose or maltodextrin. For the specialty I like roasted and chocolate malts with a blend of different caramel malts.

We like a starting gravity around 30–31 °Plato (1.129–1.134 specific gravity) and finishing around 13–14 °Plato (1.053–1.057 SG). We use brewers crystals (a mixture of corn syrup and glucose solids) and lactose to boost gravity, but Pilsner malt extract could be used in place of brewers crystals. I think 8 to 11% ABV is perfect. Anything higher than that and I find the alcohol detracts from the adjuncts. I like lower ABV versions but they still need to have a high finishing gravity to carry the flavor of the adjuncts.

Our target mash temperature is 152–154 °F (67–68 °C) and then we boil two to three hours. We start fermentation at 66 °F (19 °C) and raise to 70 °F (21 °C) when fermentation starts to slow down.

Almost all of our adjuncts are added on the cold side. After we transfer the beer to the bright tank we fill up our treatment tank with adjuncts and recirculate until we get the desired amount of flavor from the ingredients. Sometimes adjunct additions are done in stages depending on how long it takes to extract an ingredient's flavor. Coconut takes a while and cinnamon can pick up extremely quickly so planning the additions is critical to getting the right flavor profile. We use a good amount of freshly toasted nuts in our stouts and I probably enjoy those beers the most. We get better expression of nut character when they are toasted right before going in the treatment tank. Lavender stems are another ingredient we have used recently and I really enjoy the baking spice character we get from them.

We've found that a yeast strain that has a little bit of esters and one that doesn't ferment too dry is ideal for these beers. Some strains will enhance the bitterness from the roasted malt. We have changed house yeast a few times trying to find the perfect yeast for our IPAs, and have found all of them to work great for stout. My two favorite strains for stout are White Labs WLP066 (London Fog Ale) and Omega OYL-052 (DIPA Ale). Both are strong fermenters and tend to ferment down to our preferred finishing gravity without stalling.

For all of our barrel-aged versions, the beer is transferred to barrels and aged anywhere from a year to two years. We start pulling samples after six months and taste periodically to check on progress. We haven't had great results with most oak alternatives. If you can't find a small spirit barrel, Amburana wood is great for getting some vanilla and spice notes. Cypress wood is great for notes of yellow cake and vanilla wafers. We have found it takes quite a bit of both woods to get the character we want and it can be a bit on the expensive side. When I used to homebrew I would sometimes use Bourbon- or rum-soaked oak spirals with decent results so that is always an option.

Before coming up with a recipe I like to make whatever dessert I'm trying to emulate in a beer. Understanding every ingredient and how they interact with each other helps me to come up with the adjunct profile that I need and how to accomplish certain flavors.

We use a good amount of freshly toasted nuts in our stouts and I probably enjoy those beers the most.

Ben Romano has been in the craft brewing industry since 2009 and opened Angry Chair Brewing in Tampa, Florida in 2014 as Head Brewer. While not at the brewery Ben enjoys playing guitar, building guitar pedals, and spending time with his cat and dog Cupcake and Coconut.

Brian Eckert is the Founder/Brewer at Four Quarters Brewing in Winooski, Vermont. After years as a homebrewer and interactive designer at Ben & Jerry's, he founded Four Quarters in 2014.

When brewing a pastry stout I like to cut out highly roasted malts like black malt, roasted barley, and darker chocolate malts. Go with a lighter (300 °L) chocolate malt, dehusked Carafa® (we like Carafa® Special II), and add some oats or wheat in there to help give a soft body. We typically shoot for a mash temperature around 158 °F (70 °C), pH around 5.4, and a starting gravity about 22–24 °P (1.092–1.101 specific gravity), and finish around 9 °P (1.036 SG).

We have a full series called Chocolate Drop in which we use lots of chocolate malt as well as cocoa powder. We use that as a base with a wide variety of adjuncts to create a whole series — Strawberry Chocolate Drop, Coconut Chocolate Drop, Peanut Butter Coffee Drop, etc. . . . and even though it's not called Chocolate Drop, our S'mores stout would fall under this as well. We then evolved that lineup into a Cake Drop series as well.

Before you go crazy with adjuncts you need a solid base beer. Experiment with grain types and ratios, mash temperatures, and yeast varieties until you get something you really like. Then start adding adjuncts — go with small amounts first, and keep adding until you find the amount you like.

The two basic ways to incorporate special ingredients are on the hot-side or the cold-side post-fermentation. We do a little of both. We usually add things like cocoa powder and maple syrup into the whirlpool. This helps lock in some of the aromas, and also gets some extra sugar in there to boost the starting gravity. The cold-side additions are where a lot of people differ. What works for us is adding a lot of the ingredients in our bright tank and allowing the beer to condition on them until it's at the right spot to package.

The yeast characteristics should stay out of this beer style. We pretty much exclusively use a neutral American ale yeast. Ferment slow and steady. That ensures you're not picking up any hot off-flavors. And get a strong, healthy pitch of yeast going.

Michael Lalli started working at Pete's Place in Krebs, Oklahoma as a dishwasher in 1984 and worked his way up to kitchen manager. When the restaurant added a brewery in 1994, Michael became the brewer. He's still the Brewmaster at Krebs Brewing Co. as well as Prairie Artisan Ales.

Vanilla, chocolate, marshmallows, various cookies, and cakes have been my favorite additions to pastry stouts. It's always interesting and sometimes surprising how different adjuncts react with the base beer and each other, not just in flavor/aroma but body/texture as well. Sometimes a combination tricks your brain into thinking there's something there that isn't. It's the incredible range of flavors/textures brewers have been able to incorporate into the liquid that makes these beers so interesting and amazing.

We've tried so many different ways of doing everything adjunct-related; I'm not convinced there's a right/wrong way. I think the best results have come when waiting until fermentation is 100% complete, removing as much yeast as possible, and from there figure out what works for you process-wise. Just keep it simple and repeatable.

I feel like if the ABV isn't high enough (10–14% ABV) the flavor/aroma transfer from the adjuncts will be less than expected in the finished beer. I build these beers by chasing gravity points on the hot side. Pick a base malt that gives you the most gravity points per weight and build the beer around it. I'm not a fan of base malts that don't give max gravity points per pound like Maris Otter, boil times exceeding two hours, brewing a smaller batch size than your system is designed for, or the no-sparge method (though incredible beers certainly are made these ways). There are other ways to get similar results: Mash/sparge twice to get the brew kettle volume needed, use a higher percentage of specialty malts, and don't forget about flaked wheat/rye/oats. Try things other brewers have success with even if it seems crazy — you'll land on a mix of ingredients/processes that work for your system. If you need to add sugar, by all means do so, just use sugar that adds more than just gravity. Making a pastry imperial stout thin by using sugar is less of a concern than hitting the gravity I'm chasing. In the end, if the ABV isn't where it needs to be when it's time to add the adjuncts, the flavor/aroma transfer from the adjuncts will be lessened.

For fermentation you'll be good to keep it simple with the Chico strain.

HELP ME, MR. WIZARD

BY ASHTON LEWIS

A BEER'S CHANGING PROFILES

Also: Copper questions and kräusening for homebrewers

Q I HAVE BREWED A FOUNDERS BREWING CO.'S BREAKFAST STOUT CLONE FROM THE *BYO BIG BOOK OF CLONE RECIPES* EVERY YEAR WHEN IT GETS COLD OUTSIDE. IT IS FANTASTIC AND FIND IT GETS VERY CLOSE TO FOUNDERS' VERSION. I BREW THE RECIPE EXACTLY AS PRINTED USING COCOA NIBS AND KONA AND SUMATRAN COFFEES. ONE THING I HAVE NOTICED IS THAT THE FOUNDERS' BEER SEEMS TO HAVE A VERY CONSISTENT FLAVOR PROFILE WITH A NICE BALANCE OF THE CHOCOLATE AND COFFEE WHILE THE CHOCOLATE AND COFFEE FLAVORS IN MY HOMEBREWED VERSION CHANGE DRAMATICALLY OVER A PERIOD OF ABOUT THREE MONTHS. IN THE BEGINNING, THE COFFEE FLAVOR IS DOMINANT AND IT CAN BE DIFFICULT TO TASTE ANY CHOCOLATE. AFTER A FEW WEEKS THE COFFEE CALMS DOWN AND A MILK CHOCOLATE FLAVOR STARTS TO APPEAR. AFTER A FEW MORE WEEKS THE COFFEE FLAVOR TURNS REALLY EARTHY AND THE CHOCOLATE FLAVOR TURNS DRY AND ALMOST BITTER. IS THERE A WAY TO STABILIZE THESE FLAVORS?

SHAWN POGGEMILLER
DUBUQUE, IOWA

If your beer is bottled, check out your process and make sure you are doing everything you can to minimize oxygen in the package.

Photo courtesy of Shutterstock.com

A batch of cold-brewed coffee is an easy and impactful way to impart coffee flavor in your brew.

A Just reading this question makes me want to stop writing and go find one of these great beers! Describing off-flavors can be difficult, especially in beer styles with a combination of special ingredients like coffee and chocolate, special malts, and alcohol. Whether my hunches are correct about the causes of your specific problems are correct or not, they certainly will not hurt anything when followed.

The first thing that comes to mind is oxidation because oxygen has a way of dulling most fresh flavors in beer, wine, and food. And oxidation has an irritating way of changing the flavor of beer over time, like you are describing in your Founders Breakfast Stout (FBS) clone. When in doubt, consider oxidation! However, obsessing about oxygen can become bothersome and paralyzing at times, but a healthy respect of the negative effects of oxygen on beer flavor stability is a good thing. One of the easiest and most effective practices to ward off oxygen, especially in stronger beers that may spend a longer time in the fermenter, is to rack into a keg. I know the trend these days is one-pot everything, but racking has some real benefits.

Benefit #1 to racking is ditching some yeast. This can certainly be done without racking if your fermenter has a valve on the bottom that allows for purging, but a lot of brewers still ferment in containers without this feature. I'm not sure what you use, but consider racking if you are aging on yeast. What does racking and yeast sediment have to do with beer stability? Well, when yeast is left lying on the bottom of a fermenter, especially beneath higher-alcohol beer, it dies and decays (lyses) over time. And when yeast cells break apart as autolytic enzymes do their thing, these and other enzymes spill into beer. This cocktail of enzymes can lead to enzymatic degradation of beer aroma compounds from esterases, degradation

of beer foam from proteolytic enzymes, a general dulling of aroma, and the development of umami flavors (soy, meaty, brothy). Getting yeast sediment away from beer is always a good idea after the heavy lifting of fermentation is over.

Another benefit of racking into a keg is to definitively seal the beer up from the environment. This can also be done in a stainless fermenter, but not all homebrewers have these silver gems. Filling a Corny keg with water, blowing down with carbon dioxide, and racking in through the dip-tube is an easy and effective way of moving beer. Since the Founders clone has coffee grounds added to the fermenter, racking also gets the beer off of the coffee. Sitting on grounds for prolonged durations may lead to issues.

If your beer is bottled, check out your process and make sure you are doing everything you can to minimize oxygen in the package. Bottling is a major thing for homebrewers because beer does not foam when filling flat beer into bottles. Many brewers, both commercial and recreational, place way too much faith in the antioxidant property of yeast. Chemical oxidation occurs very rapidly and sleepy yeast are unlikely to absorb oxygen introduced during packaging fast enough to prevent beer oxidation. Founders packages all of their major brands after carbonation and is able to crown/lid on foam. This is a great way of pushing air out of the bottle headspace. If you are capping flat beer, that air in the headspace is 19% oxygen. Adding some fresh yeast at bottling time is one way to address this issue, especially for beers that are being bottled with priming sugar 4+ weeks after brewing. But don't be tempted to fill bottles with little to no headspace. My preference is to counter-pressure fill and crown on foam, even when doing some secondary fermentation in the bottle. That's a discussion for another day.

Besides oxidation and prolonged exposure to yeast sediment, another thing that pops to mind is ingredient selection. Although the types of coffee and chocolate are specified in the recipe, no specifics about quality is provided. Quality can be a nebulous term and it's impossible to have agreed upon quality metrics without some sort of testing methods. Cacao nibs, chocolate, and, especially, roasted coffee all are subject to oxidation. The general advice from coffee roasters about the storage of roasted beans is to use them within about two weeks of roasting for the freshest flavor. Ingredient quality, particularly with non-traditional brewing ingredients, can be a real game changer. Not much more to comment on this without knowing more about your coffee and chocolate sources. The bottom line is that you want fresh ingredients with great taste and aroma profiles.

The last thing that comes to mind is probably a stretch, but water chemistry is certainly an important factor for all beers. Aroma decay is not something associated with water chemistry, but the balance of a beer without a lot of roasted malt and roasted adjuncts can definitely be affected by water.

Years ago, I heard a great story from a practical brewer that was part fable and truth. This brewer proclaimed that the brewery brewed the best, most consistent beer possible, and then the packaging department messed everything up by packaging the brewery's beer. Not so much a story about throwing the packaging department under the bus, but a story of life and recognizing the finite time we, and our beers, have before succumbing to the steady beat of the metronome. Extending beer freshness is a multibillion-dollar pursuit and there are no silver bullets. Hopefully some of the tips provided here will help you out. In the meantime, drink your beer fresh and brew more when you run out!

Q I AM RELATIVELY NEW TO HOMEBREWING AND RECENTLY BOUGHT A COPPER IMMERSION CHILLER. IT WORKS GREAT FOR WORT COOLING, BUT LOOKS REALLY BROWN AFTER IT DRIES. IS THIS SOMETHING I NEED TO CLEAN OFF BEFORE USING THE NEXT TIME I BREW?

PIERRE VANDEN BORRE
GATINEAU, QUÉBEC

A Many brewers and cooks love copperware for its heat transfer properties and attractive appearance. One of the downsides, however, to copper is that pretty, honey-like color turns brown over time and requires polishing to restore the shine. And sometimes, the brownish tint turns green. The good news is that brown and greenish-brown copper surfaces are normal and have no negative effects on brewing. Copper, like most metals, is covered with a visible oxide film. In the case of copper, this film is smooth and brown in color. Over time, the brown film on copper may turn green from sulfur in the atmosphere raining down on exterior surfaces such as gutters, cupola roofs, weather vanes, and sculptures.

Let's talk about cleaning of copper brewing tools. The most common uses of copper for brewing equipment are brewhouse vessels, especially brew kettles, coolships, Baudelot (falling-film) wort coolers, and, in the case of homebrewing, immersion chillers. One commonality of all of these brewing tools is that they are used on the hot side of brewing in contact with wort (as opposed to beer) and the surfaces that do touch wort are visible. Copper is a good fit for these uses because all benefit from copper's high thermal conductivity and all are exposed to hot or, in the case of Baudelot chillers, hottish wort. The easiest and most effective way to clean copper vessels and coolers is by using a mild cleaning solution, like sodium carbonate, with some gentle scrubbing with a non-abrasive brush, followed by a water rinse. Strong alkaline cleaners, such as sodium or potassium hydroxide, and acidic cleaners can damage copper. Breweries with real copper brewhouse vessels, as opposed to stainless tanks with copper façades, usually use special cleaners with corrosion inhibitors to prevent their beautiful vessels from slowly wearing away.

Without going down a rabbit hole, it is worth noting that

here in the states, the U.S. FDA (Food and Drug Administration) restricts the use of copper in commercial food processing to foods with pH > 6.0, with the exception of brewing, where copper is a permitted wort and beer contact surface. This is because copper can be toxic to people and because acidic liquids dissolve copper from the surface of metals. Copper can also oxidize beer, so very little copper equipment is found in breweries after wort cooling.

The topic of toxicity sounds a bit scary, but a survey of commercially available beers in 2017 found beer copper levels below World Health Organization guidelines for drinking water (*Journal of Brewing & Distilling*, Vol. 7(1), pp. 1-4, March 2017). There is a benefit to having some copper in wort because copper binds sulfur produced in fermentation. In fact, stainless steel brew kettles often contain sacrificial copper parts or strips specifically for the purpose of adding a bit of copper to wort for sulfur binding. But again, once fermentation is complete, brewers do not want beer to contact copper because copper can oxidize beer.

The next time you use your copper wort chiller, thoroughly rinse after use, clean with a mild detergent and a sponge or brush, rinse, dry, and store. And no worries about the patina, as the brown is just copper oxide. The great thing about immersion chillers is that the sanitizing step occurs immediately before use by simply submerging in the wort during the last 5–10 minutes of wort boiling.

Q I'VE BEEN PLAYING AROUND WITH FERMENTING UNDER PRESSURE USING A SPUNDING VALVE AND NOW WANT TO START KRÄUSENING. IS THAT SOMETHING WORTH MESSING AROUND WITH AT HOME? I AM NOT REALLY CLEAR WHAT THIS METHOD IS AND WHAT IT IS SUPPOSED TO DO FOR MY BEER. A LITER FOR YOUR THOUGHTS!

ALAN DUFRESNE
COLLEGE STATION, TEXAS

A Kräusening is a lagering method with two main uses. And both are based on the same basic technique of adding some beer in the "high kräusen" stage of fermentation to beer that has undergone primary fermentation. The attenuation level of the beer being kräusened is what divides the two uses. Let's start with beer that has undergone a normal and relatively rapid primary fermentation and finish this discussion with beer that is either lagging towards the end of the race or is predicted to soon begin to lag.

Some brewers use kräusening as a routine method of lagering where about 8.5 parts of fermented beer is moved into a lagering tank followed by the addition of about 1.5 parts kräusen beer. These two beers can be brewed from the same recipe or a special kräusen beer may be brewed specifically for kräusening. Breweries routinely kräusening face the challenge of having kräusen beer in the right stage of fermentation, the high kräusen or "high crown" stage, to add to the beer being kräusened. The solution to the challenge is proper planning so that actively fermenting beer with about 75% or more of its original wort gravity is available for kräusening. When a brewer kräusens several different beers, a standard kräusen beer makes sense in a production facility.

Scheduling details aside, what's up with the method? Kräusen beer is added after the attenuated beer is added to the lagering tank because the kräusen beer is heavier than the other beer and will layer on the bottom of the lagering tank. This is especially relevant when a horizontal lager tank is used. The cool and handy part of this process is that the kräusen beer brings with it healthy and vibrant yeast, fermentable sugars, and wort nutrients. Think of this beer as a fresh crew on a construction site coming to relieve the tired folks who have been working for 10 hours and need to rest.

Because the kräusen beer is layered on the bottom of the tank, the release of carbon dioxide and the generation of heat sets up gas and convective currents in the lagering tank. In other words, the tank is mixed by the action of the fresh yeast on fermentables. Some breweries add surface area to the lagering tank in the form of beechwood chips and this surface area serves as a huge site for yeast to do cool stuff to the fermented beer in the tank. More on that in a second. While you have been reading and I have been typing, carbon dioxide has been sneaking out of the lagering tank, so let's attach a spunding valve and carbonate our beer while this cool stuff is happening.

"Because the kräusen beer is layered on the bottom of the tank, the release of carbon dioxide and the generation of heat sets up gas and convective currents in the lagering tank."

The cool stuff is an increase in maturation rate. Diacetyl and acetaldehyde are the two heavy hitters whose concentrations in beer usually dictate the time required for lagering. Many breweries monitor these two aroma-active molecules before deep chilling and filtration. Because active yeast accelerates the biochemical reduction of diacetyl into

2,3 butanediol and acetaldehyde into ethanol, aging times can be cut when yeast absorbs these "green" compounds from beer, biochemically reduces these by moving hydrogen from NADH to acetaldehyde and diacetyl, thereby regenerating NAD+. Although the concentrations of acetaldehyde and diacetyl are indeed lowered (reduced) by this reaction, the term "reduction" refers the movement of hydrogen in these biochemical reactions.

So in effect kräusening speeds up aging! And by the time the beer is fully attenuated by the clean-up crew, it's also carbonated with hopefully none of the green aromas of young beer. We are talking brewing here, so things don't always go as planned and the process must be monitored like anything else. The technique is called kräusening, not Prest-O Change-O.

Kräusening is also an extremely powerful arrow in the brewer's quiver for warding off lagging, high-gravity fermentations or as an emergency tool to deal with the occasional lagging or stuck ferment. Many of us are surely thinking about brewing strong beers for the winter and are checking out the malty malts for doppelbocks. This is a great style to simply plan on kräusening. The benefits are the same as described above, but unlike kräusening a Pilsner or helles fermentation with kräusen beer that is brewed from the same recipe, strong beers, like doppelbock, do not make great kräusen beers because their strength is stressful on yeast. In a commercial brewery with several brews to choose from, a brewer may kräusen as a Plan B emergency and simply grab a bit of normal strength beer from a batch that will not stick out in the beer being jump-started. Drastic times sometimes call for drastic measures, but some lagging ferments should come as no surprise in certain styles. I suggest simply planning on kräusening for bigger beers like doppelbock, barleywines, imperial stouts, etc. Just because kräusening is a lagering method does mean that it cannot be used for ale.

So, let's finish up with a brief how-to-kräusen summary. In this example, the beer being kräusened is a Mashinator Doppelbock. The minimum wort strength of this fictitious brew, as defined by the conventions of doppelbock naming, is 1.076 (18.5 °Plato) because the suffix "-ator" is used. We'll revisit that in a moment. OK, here we go:

- The brew day will be normal, except we are going to get a bit clever with our wort strength and volumes. For starters, the target wort strength is going to be bumped to 1.082 (19.65 °Plato) because our beer will contain 85% of the total fermented from 1.082 (19.65 °Plato) wort and 15% of the total from a 1.048 (12 °Plato) wort, for a blended wort strength of 1.076 (18.5 °Plato). The total volume in this example is 6 gallons (23 L) of beer (full-strength wort + kräusen wort).

  We also will prep for kräusening by pulling 0.55 gallons (2 L) of 1.082 (19.65 °Plato) wort and diluting to 1.048 (12 °Plato) by adding about 0.35 gallon (1.3 L) of water, then freezing for future use as kräusen beer.

  At the end of the brew day, the goal is to start our fermentation with about 5 gallons (19 L) of 1.082 (19.65 °Plato) wort.
- For this example, the transfer trigger into lagering will be when our fermentation has dropped to about 1.028 (7 °Plato) because that's about when fermentation rate can begin to lag. In other words, we want the relief crew to start working before the day shift packs it up for the evening! This is where some educated guesswork is required.
- When the fermentation is down to around 1.034–1.036 (8.5–9.0 °Plato), we are going to take our frozen wort from the freezer, thaw, boil to sterilize, cool, aerate, and pitch with fresh yeast. Whether liquid or dry, pitch based on the volume of kräusen beer. In this example, that's 0.9 gallon (3.3 L). This mini-fermentation can be conducted in a glass jug or small bucket. After about 48–60 hours, the fermentation should be in the high kräusen stage and ready for use.
- Rack the high-gravity beer into a Corny keg, a handy 5-gallon (19-L) lagering vessel, through the dip tube (the keg's "Out" connection), then rack the kräusen beer into the keg, again through the dip tube, connect a hose to an "In" fitting, and insert the end of the hose into a container of water. This allows for visual monitoring of the fermentation by observing gas bubbles and also allows time for carbon dioxide to freely escape the lagering tank and flush oxygen from the headspace. After 1–2 days of fermentation, replace the hose with a spunding valve adjusted to the correct pressure for the tank temperature. In this case, assume the lagering tank is at 50 °F (10 °C) and we want to equilibrate at 18 psig (gauge pressure) for about 2.5 volumes of gas. As fermentation builds pressure in the lagering tank, the spunding valve will begin to vent excess gas once the pressure reaches 18 psig.
- That's it until fermentation is over. Taking samples is only required if you want to. If this beer is for holiday enjoyment, I would leave it at 50 °F (10 °C) for about three weeks, sample at the end of this period to confirm that the show is over, remove the spunding valve, then transfer the keg into a cold spot. BYO

Photo by Mick Spencer

A spunding valve is an effective means to naturally and safely carbonate beer.

BY GORDON STRONG

CZECH DARK LAGER

Prague's dunkel

To understand Czech dark lager, we first have to understand how Czech beer *(pivo)* is categorized.

CZECH DARK LAGER
BY THE NUMBERS

OG:	1.044–1.060
FG:	1.013–1.017
SRM:	17–35
IBU:	18–34
ABV:	4.4–5.8%

Photo by Charles A. Parker/Images Plus

The more I drink craft beer, the more I find myself gravitating towards lagers. The crisp, clean, pale lagers get all the attention, but the classic dark lagers are what I find most satisfying. While Czech dark lager was just added to the Beer Judge Certification Program (BJCP) Style Guidelines in 2015, I have been encouraged to see more of the U.S. craft lager producers making them. I wanted to add this style to the 2004 Style Guidelines but others seemed unfamiliar with it because we didn't see any imported or domestic examples. Fortunately, times have changed.

To understand Czech dark lager, we first have to understand how Czech beer (*pivo*) is categorized. Czechs describe their beer by color (pale, amber, dark – *světlé, polotmavé, tmavé* – but also may call their dark beers *černé,* or black) and strength in degrees Plato original extract (starting gravity). So, you might refer to a beer from a certain brewery as a *tmavé* 12, for instance. As an approximation, 1 °Plato is about 4 gravity points, so a 12 °P beer has an original gravity of 1.048.

The different strengths are also grouped into three broad gravity classes: Draft, lager, and special – *výčepní, ležák, speciální.* The draft strength beers are 7–10 °P, but may be bottled. The lager strength beers are 11–12 °P and are aged but aren't necessarily bottom-fermented. The special strength beers are 13–20 °P, but aren't that rare. Yes, their terms can be confusing for English speakers, but once you understand their system, the beers are easy to understand.

As an aside for purists, Czech beers are actually measured in degrees Balling, since the scale was invented by a Czech chemist in 1843. But degrees Balling, degrees Plato, and Brix are essentially interchangeable and are used in different industries and locations. If you really want to know, Balling was first and used a reference temperature of 17.5 °C (63.5 °F); Plato came later as a refinement and used 20 °C (68 °F). At the precisions used in brewing, the difference is negligible. I use degrees Plato because it is the most common term used throughout the commercial brewing industry.

Czech dark lager is BJCP style 3D in the Czech Lager style category. This style actually encompasses dark lagers in two strength categories, with a range of 11–15 °P (OG 1.044–1.060). It was a compromise to allow a wider range of Czech beer to be described, but understand that Czechs will use the color and the gravity as the primary descriptors.

HISTORY

The Czech Republic (a.k.a. Czechia) as a modern state dates to 1993, after Czechoslovakia broke up after the fall of communism. But the lands of Bohemia and Moravia, which make up most of the Czech Republic, have a much longer history. Beer has been brewed in this area for over a thousand years. Bohemia is known for its hops, and Moravian barley is well regarded. The U Fleků brewery in Prague opened in 1499, and makes the best-known example of the style today, a 13 °P (1.053 SG) special.

Prague, the national capital, is in Bohemia, as are other major beer-producing towns of Plzeň (Pilsen), České Budějovice, and Žatec. Bohemia is just to the east of the northern Bavarian region of Franconia in Germany, which also explains some of the similarities between German and Czech styles. As with the Munich dunkels of Germany, the Czech dark lagers are a traditional

CZECH DARK LAGER

(5 gallons/19 L, all-grain)
OG = 1.044 FG = 1.013
IBU = 26 SRM = 27 ABV = 4.1%

INGREDIENTS

6 lbs. (2.7 kg) Continental Vienna malt
1.75 lbs. (794 g) Continental dark Munich malt (11 °L)
1.5 lbs. (680 g) Caramunich® III malt (57 °L)
8 oz. (227 g) Carafa® Special II malt (430 °L)
4 AAU Czech Saaz hops (60 min.) (1 oz./28 g at 4% alpha acids)
6 AAU Czech Saaz hops (15 min.) (1.5 oz./43 g at 4% alpha acids)
1.5 oz. (43 g) Czech Saaz hops (1 min.)
White Labs WLP802 (Czech Budejovice Lager), Wyeast 2278 (Czech Pils), or SafLager W-34/70 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

If using a liquid strain, two or three days before brew day, make a 2-qt. (2-L) yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast. Use two sachets if using a dry yeast strain.

On brew day, prepare your ingredients: Mill the grain, measure your hops, and prepare your water. This recipe uses reverse osmosis (RO) water. Add ¼ tsp. 10% phosphoric acid per 5 gallons (19 L) of brewing water, or until water measures pH 5.5 at room temperature. Add 0.5 tsp. calcium chloride ($CaCl_2$) to the mash. Use enough water to have a moderately thick mash (1.5 qts./lb. or 3.1 L/kg).

This recipe uses a step mash program with a mashout. Mash in the Vienna and dark Munich malts at 131 °F (55 °C) and hold for 15 minutes. Raise the mash temperature to 149 °F (65 °C) and rest for 30 minutes. Raise the mash temperature to 158 °F (70 °C) and rest for 30 minutes. Begin recirculating, add the Caramunich® and Carafa® malts, mix gently without disturbing the grain bed, then raise the mash temperature to 170 °F (77 °C) for mashout, recirculating the whole time. Hold at mashout temperature for 15 minutes.

Sparge slowly with 170 °F (77 °C) water until 6.5 gallons (25 L) of wort is collected.

Boil the wort for 60 minutes, adding the hops at times indicated in the recipe. At the end of the boil, let the wort settle for 10 minutes.

Chill the wort to 46 °F (8 °C). Oxygenate the wort, then pitch the yeast starter. Start fermentation at 46 °F (8 °C) but allow the temperature to rise to 50 °F (10 °C) until fermentation is complete. Rack the beer. Lager the beer at 32 °F (0 °C) for 11 weeks, then fine with gelatin or filter.

Prime and bottle condition, or keg and force carbonate to 2.5 volumes. If bottle conditioning, warm condition the beer at 68 °F (20 °C) for one to two weeks before chilling.

CZECH DARK LAGER

(5 gallons/19 L, extract with grains)
OG = 1.044 FG = 1.013
IBU = 26 SRM = 27 ABV = 4.1%

INGREDIENTS

3.6 lbs. (1.6 kg) Pilsen liquid malt extract
1.4 lbs. (635 g) Munich liquid malt extract
1.5 lbs. (680 g) Caramunich® III malt (57 °L)
8 oz. (227 g) Carafa® Special II malt (430 °L)
4 AAU Czech Saaz hops (60 min.) (1 oz./28 g at 4% alpha acids)
6 AAU Czech Saaz hops (15 min.) (1.5 oz./43 g at 4% alpha acids)
1.5 oz. (43 g) Czech Saaz hops (1 min.)
White Labs WLP802 (Czech Budejovice Lager), Wyeast 2278 (Czech Pils), or SafLager W-34/70 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Start with 6 gallons (23 L) of brewing water in the brew kettle; heat to 158 °F (70 °C).

Steep the Caramunich® and Carafa® malts in a mesh bag for 30 minutes. Remove and rinse grains gently. Turn off heat.

Add the malt extracts and stir thoroughly to dissolve the extract completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil. Boil the wort for 60 minutes, adding the hops at the times indicated in the recipe. At the end of the boil, let the wort settle for 10 minutes.

Chill the wort to 46 °F (8 °C). Oxygenate the wort, then pitch the yeast starter. Start fermentation at 46 °F (8 °C) but allow the temperature to rise to 50 °F (10 °C) until fermentation is complete. Rack the beer. Lager the beer at 32 °F (0 °C) for 11 weeks, then fine with gelatin or filter.

Prime and bottle condition, or keg and force carbonate to 2.5 volumes. If bottle conditioning, warm condition the beer at 68 °F (20 °C) for one to two weeks before chilling.

TIPS FOR SUCCESS:

While a step mash will help the yeast acheive a full attenuation with this beer, hitting the various temperatures precisely is not crucial. A few degrees off in either direction will not ruin things. Another option is to just slowly heat the mash from 131 °F (55 °C) up to 170 °F (77 °C) over the course of 60–75 minutes to achieve a similar effect.

Yeast health and fermentation temperature control are always two crucial factors when brewing lagers. Make sure to pay close attention to these details in order to produce a clean example of this style of beer. A small addition of yeast nutrients near the end of the boil will often be a good thing as well.

brown beer style that have held on into modern times.

Before pale lagers were introduced in 1842 in Prague, beers were generally darker in color and clarity didn't matter as much since beer was not drunk from glassware. But don't make the mistake of assuming this means "lagers were invented" in 1842, and therefore dark lagers came later. Remember that lagering is a cold maturation process, and that lager yeast (*Saccharomyces pastorianus*) are bottom-fermenting — lager as a type of beer refers to the use of both. The lagering process was used hundreds of years before this time, although characterization of pure strains of yeast was a later advancement.

SENSORY PROFILE

Czech beer has a national character that is a bit different from the more well-known German lagers. Czech beer tends to have a greater amount of unfermented extract in the finished beer, which gives it a fuller body and mouthfeel, and a richer, slightly more complex flavor profile. Czech yeast strains are not always as clean as German counterparts, and can have diacetyl at a near sensory threshold level. These characteristics are present in Czech dark lager.

From a judging standpoint, this style is quite broad — no one beer defines the style. We've already mentioned the range of strength, but the balance of hops and the flavor of the darker malts are two other areas of variation. The malt can have caramel and roast flavors from low to moderate, which add character to the rich Munich-like base malt flavors. Malt flavors such as caramel, toast, nuts, licorice, dried dark fruit, chocolate, or coffee may be present.

The caramel flavors will have some sweetness, naturally, but the beer shouldn't seem overly sugary-sweet. It really needs the rich flavor of malt as the base, not something neutral. Likewise, any roast qualities should be restrained — they shouldn't have burnt notes, or make you think you are drinking a porter or stout. The caramel and roast should accentuate and enhance the rich base malt flavors, not be a substitute for them, and they provide much of the defining malt flavor for the style.

The hop aroma, flavor, and bitterness are somewhat variable, which also affects the balance. Traditional versions often have a sweeter or less bitter balance, while modern craft versions are more hoppy and bitter. A spicy hop aroma and flavor may or may not be present, but should complement the malt. There should be some residual sweetness, but the bitterness level can sometimes keep it from being too obvious. There may be some darker fruit flavors, like plums or berries, and trace buttery diacetyl is sometimes present, but should be more as a mouthfeel enhancer rather than a flavor.

The beer should be smooth and mouth-filling without seeming heavy or cloying. It may have a creamy texture, and carbonation is moderate to low. Alcohol warmth may be present in stronger examples, since the style can range from 4.4 to 5.8% ABV. The color ranges from dark copper to almost black, but is usually clear with a good head stand. In general, I think it has the character of a somewhat hoppy Munich dunkel or malty schwarzbier.

BREWING INGREDIENTS AND METHODS

Czech brewers traditionally prefer decoction mashes, most often double decoctions, as they feel it produces beer with their national character. While Germans have largely switched to step mashes, Czechs will still perform decoction mashes with modern malts because of flavor and mouthfeel effects. Some brewers will use step mashes with a higher percentage of richer malts if a decoction mash is not to be employed.

The well-known U Fleků beer is reported to use four malts. When thinking about recipe formulation, I'd say that four classes of malts are needed in this style. A base malt, like Pils or Vienna malt, should be 50–60% of the grist. A richer malt, like Munich or dark Munich, can be 20–40% of the grain bill. A caramel-type malt, like Caramunich® II or III, can be 5–15%, and a darker malt, like Carafa® Special II or III, around 5% of the grist. While I think four malts is sufficient, you may also choose multiple malts within each of the four classes if you wish. This general template gives you quite a bit of room for personalizing your recipe.

> **When using darker malts, try to use the debittered or huskless versions since you don't want sharp, burnt, or acrid flavors.**

When using darker malts, try to use the debittered or huskless versions since you don't want sharp, burnt, or acrid flavors. The debittered roasted malts have a smooth roast flavor without the harsh bite. Michael Jackson noted that some breweries use coloring agents instead, but that he thought they tasted inferior. I would use German or Czech malts throughout, as they are more likely to have the traditional flavors for the style.

Czech hops (especially the Saaz variety) are characteristic for the style, particularly in the flavor and aroma. Three additions (bitterness, flavor, and aroma) are traditional, but dry hopping is not a traditional method. The level of late hops can vary quite a bit with commercial examples, and the balance of bitterness-to-malt is another stylistic choice. I prefer this style a little on the hoppy side to help differentiate it from Munich dunkels in competition.

Czech beers normally are brewed using water with a very low mineral content; sulfates in particular are typically avoided as they can sharpen the finish and clash with the hops. A Czech or a clean, malty German yeast strain works best, as Czech beers often have a very small bit of residual unfermented extract (sugars and other dissolved

Photo by Michael Nusair/upinthenusair.com

One of the classic examples of the Czech dark lager, U Fleků restaurant and brewery located in Prague, has a history dating back to 1499 and is also well known for one of its food items on the menu . . . pickled cheese.

matter, basically implying a higher final gravity). Czech fermentation practices are often a bit cooler than German practices and lagering can take longer. Patience is key during the conditioning phase of production.

HOMEBREW EXAMPLE

My example is a lower-gravity modern Czech dark lager, coming in as an 11 °P (1.044 SG) beer. I prefer maltier versions of this style a touch stronger but this version is on the hoppy side to help distinguish it from its German cousin. When I wrote about Czech amber lager in the July-August 2016 issue, I included a classic double decoction mash program. That same mash schedule could be used for this beer. You can find that full article and recipe at https://byo.com/article/czech-amber-lager/. As an alternative, I'm presenting a step infusion mash program in this recipe that is a little easier to execute.

I'm selecting from the four classes of malt I mentioned in the ingredients and methods discussion. Vienna is the base malt, dark Munich is the rich malt, Caramunich® III is the caramel malt, and Carafa® Special II is the dark malt. These are all on the richer side, which is a choice made because of the mash schedule. German malts are fine for this recipe; I would not use North American malts because the flavor profile wouldn't be the same as their European counterparts.

Three additions of Czech Saaz hops provide the authentic hop character, and the bitterness is a bit higher to help balance the malt. I'm using quite a few late hops, so there should be noticeable hop flavor and aroma. If you can't get good fresh Czech Saaz hops, I've found that U.S. Sterling hops are an acceptable substitute.

Czech beers are made with low mineral water, which suits my typical reverse osmosis (RO) water method just fine. A little calcium chloride will help with the rounded malt flavor, while assisting mash performance. This amount is half what I typically use in most styles as a nod to the lower mineral Pilsen profile.

I'm calling for Czech Budejovice lager yeast, and using a Czech fermentation schedule with a cool fermentation and a long lagering time. If you can't find this yeast, the cleaner German W-34/70 strain (liquid or dry) will also produce a nice beer. Please don't do anything to try to accentuate a diacetyl character – it really shouldn't be noticeable.

This recipe allows for customization. You can increase the strength, decrease the bitterness, decrease the late hops, or adjust the caramel and roast percentages based on your personal preferences. As long as you follow the general guidelines I've given, you will likely make a beer that fits within the broad style. And I'd really like to try it. BYO

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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.
Drew Beechum and Denny Conn on Simplifying Your Homebrewing

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 and Audra Gaiziunas* – 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. Plus for one full day you will learn brewery financials, keys to a good business plan, and other start-up money skills with craft beer numbers expert Audra Gaiziunas.

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.

SUNDAY, NOVEMBER 7, 2021

INSIDER TOUR OF DENVER-AREA CRAFT BREWERIES

You'll tour – and taste – at four different craft breweries in the Denver area during this post-event extra 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 wrap up your BYO Boot Camp experience and check out some of Denver's thriving craft beer scene.

We look forward to seeing you in person in Denver!
Three-Day and Two-Day Registration Options Available.
Full Event Details Available at:

BYOBootCamp.com

Counting Calories & Carbs

by Stephen Stanley

Get the skinny on your homebrew

Beer is food and as food, it contains calories. Much confusion about drinking beer and losing weight exists and, thanks to a recent diagnosis of type II diabetes, I have become very interested in the carbohydrate content and calories in my beer. My brewing software provides the estimated grams of carbohydrate and calories per pint of homebrew, which started me down a path of wanting to learn more about how calories and carbohydrates in beer can be estimated.

The macronutrients in beer are alcohol and carbohydrates. The carbohydrates in beer are small glucose polymers and dextrins — complex sugars yeast can't metabolize. Unfortunately, beer provides very few other nutrients, hence the term empty carbs. In the past, beer was a valuable source of energy. Today we in developed countries have enough food that beer is no longer a dietary necessity, but a luxury.

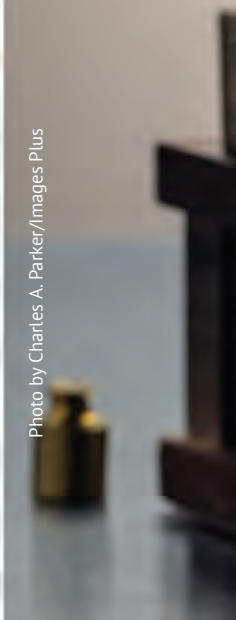


Photo by Charles A. Parker/Images Plus

ESTIMATING CALORIES

The Oxford Companion to Beer provides a formula for estimating calories in beer:

Kcal = 6.9 kcal / g x %ABW + 4 kcal/g x (RE – ash)

Where:
Kcal = kilocalories.
ABW = the alcohol by weight.
RE = real extract in degrees Plato.
ash = an experimentally-derived factor representing mineral solids in the beer, generally set to 0.1.

The two terms (RE and ash) represent the calories from alcohol and the calories from carbohydrates and proteins per 100 mL of beer because both the ABW and the RE are percentages.

We'll start by estimating the calories provided by alcohol. Ethanol provides 6.9 Calories per gram, technically kilocalories, or the energy required to heat a kilogram of water one degree Celsius. To estimate the number of calories from alcohol in a beer, first calculate the number of grams of alcohol in the beer. In the U.S., beer strength is given in alcohol by volume (ABV). ABV can be converted to ABW by multiplying the volume of beer by %ABV resulting in milliliters of alcohol. Convert milliliters to grams by multiplying milliliters by 0.79 g/mL, the density of ethanol. Then multiply the grams of alcohol in the beer by 6.9 Calories/gram. To convert ounces of beer to milliliters, multiply the ounces of beer by 29.57 mL/oz. A 12-oz. bottle is 355 mL, a pint is 473 mL.

Example: Let's calculate the calories from alcohol in a 12-ounce (355-mL) bottle of 5.5% ABV beer. The ABW is 5.5% x 0.79 = 4.3%. The calories in 100 mL are 6.9 Kcal/g x 4.3 g/100mL = 29.7 Kcal/100 mL. The calories from alcohol in a 12-ounce (355-mL) bottle are 3.55 x 100 mL/bottle x 29.7 Kcal/100 mL = 105 Kcal/bottle from alcohol.

Or, if you'd rather not do the math, refer to Chart 1.

ESTIMATING CARBOHYDRATES

Beer's carbohydrates are comprised of the sugars and dextrins remaining after fermentation. If you know the beer's original and final gravities, and as a homebrewer you should know these quantities, you can estimate the beer's carbohydrates by estimating the real extract (RE), the percentage of dissolved solids remaining in a beer after fermentation. This is represented by the second term in the equation given earlier.

The key to estimating the carbohydrates in beer is understanding the RE, the amount of carbohydrate remaining in the beer after fermentation. Balling provides a formula to estimate the RE based on the original extract (OE) and the apparent extract (AE), the gravity measured after fermentation is complete, measured in degrees Plato. Note that for estimation purposes, degrees Plato are roughly equivalent to gravity points divided by four:

RE = (0.18 x OE) + (0.82 x AE)
(where the result is in grams/100 mL).

Example: Estimate the extract in a 12-ounce (355-mL) bottle of a beer starting at 14 °P and finishing at 4.5 °P. RE = (0.18 x 14 °P) + (0.82 x 4.5 °P), or 6 g/100 mL. To scale to a 12-ounce (355-mL) bottle, multiply by 3.55 mL resulting in an estimate of 22.0 g real extract per bottle.

According to the Michigan Brewer's Guild, the formula produces most accurate results when the Real Degree of Fermentation (RDF), the actual percentage of extract converted to alcohol, is near 65%. A full-bodied beer may have an RDF of 50%, a highly attenuated beer may have an RDF over 80% but, for a useful estimate of the calories or carbs in beer, assuming an RDF of 65% yields a close-enough estimate. The resultant RE is in degrees Plato, the percentage of carbohydrate remaining in 100 grams of beer. Subtract the ash from the RE to obtain the grams of carbohydrate in 100 mL of beer, then multiply by 4 Kcal/g to estimate the caloric contribution from carbohydrate.

Example: A beer with an estimated RE of 4.8 °P provides 4.7 grams of carbohydrate per 100 grams of beer (4.8 g/100 mL – 0.1g/100 mL). Multiply by 4 Kcal/g, then by 3.5 x 100 mL/bottle to obtain an estimate of 66 Kcal per 12-ounce (355-mL) bottle from carbohydrates.

Chart 1: Ethanol Calories per Serving of Beer

ABV	Kcal/mL beer	Kcal/oz. beer	12 oz. (355 mL)	16 oz. (475 mL)	500 mL
3.5%	0.19	5.6	68	90	95
4.0%	0.22	6.4	77	103	109
4.5%	0.24	7.3	87	116	122
5.0%	0.27	8.1	97	129	136
5.5%	0.30	8.9	105	142	150
6.0%	0.33	9.7	116	155	163
6.5%	0.35	10.5	126	168	177
7.0%	0.38	11.3	135	181	191
7.5%	0.41	12.1	145	193	204
8.0%	0.44	12.9	155	206	218
8.5%	0.46	13.7	164	219	231
9.0%	0.49	14.5	174	232	245
9.5%	0.52	15.3	184	245	259
10.0%	0.54	16.1	193	258	272

Chart 2 shows the grams of carbohydrate in a 12-ounce (355-mL) beer given the original and final gravities using the SG scale used by most homebrewers:

Chart 2: Carbohydrate Calories per Bottle (12-oz./355-mL) of beer

OG↓ FG→	1.005	1.010	1.015	1.020	1.025	1.030	1.035	1.040	1.045	1.050
1.030	33	48								
1.035	36	51	65							
1.040	40	54	68	83						
1.045	43	57	71	86	100					
1.050	46	60	75	89	103	118				
1.055	49	63	78	92	106	121	135			
1.060	52	66	81	95	110	124	138	153		
1.065	55	70	84	98	113	127	141	156	170	
1.070	58	73	87	101	116	130	145	159	173	188
1.075	62	76	90	105	119	133	148	162	176	191
1.080	65	79	93	108	122	136	151	165	180	194
1.085	68	82	97	111	125	140	154	168	183	197
1.090	71	85	100	114	128	143	157	171	186	200
1.095	74	89	103	117	132	146	160	175	189	203
1.100	77	92	106	120	135	149	163	178	192	206

If you are interested in the grams of carbohydrate in the beer, divide the carbohydrate calories by four Kcal/g to obtain an estimate. Or if your interest is the total calories in a 12-ounce (355-mL) beer, add the alcohol calories and the carbohydrate calories. Or you can refer to Chart 3:

Chart 3: Total Calories per 12-oz. (355-mL) Beer

OG↓ FG→	1.005	1.010	1.015	1.020	1.025	1.030	1.035	1.040	1.045	1.050
1.030	96	98								
1.035	112	113	115							
1.040	127	129	131	133						
1.045	143	145	147	148	150					
1.050	159	160	162	164	166	168				
1.055	174	176	178	180	182	183	185			
1.060	190	192	194	195	197	199	201	203		
1.065	206	207	209	211	213	215	217	218	220	
1.070	221	223	225	227	229	230	232	234	236	238
1.075	237	239	241	242	244	246	248	250	252	253
1.080	253	254	256	258	260	262	264	265	267	269
1.085	268	270	272	274	276	277	279	281	283	285
1.090	284	286	288	289	291	293	295	297	299	300
1.095	300	301	303	305	307	309	311	312	314	316
1.100	315	317	319	321	323	324	326	328	330	332

Measurements of Wort Gravity and Extract

Gravity is measured as specific gravity, a dimensionless ratio of the mass of the solution to the mass of an equal volume of water at the same temperature, meaning that 100 mL of a 1.048 SG wort weighs 1.048 times that of 100 mL of water. Specific gravity is commonly used by British brewers or brewers using the British brewing tradition, including most U.S. homebrewers.

Extract is commonly measured using the Plato scale, a measurement of dissolved solids in wort. The measurement is defined as grams of extract per 100 grams of wort at 20 °C (68 °F). As an example, 100 g of 12 °P wort contains 12 grams of extract. The Plato scale is used by most brewers worldwide with the notable exception of British brewers or brewers using British tradition.

The Brix, or Balling Scale, is effectively the same as the Plato scale, with Brix or Balling more commonly used in the wine industry. The difference between Brix/Balling and Plato are the reference temperatures of the wort (20 °C/68 °F for Plato and 17.5 °C/63.5 °F for Brix/Balling). At the homebrew scale, Brix, Balling, and Plato can be considered equivalent. As a rough approximation, to convert from Plato to gravity points, multiply the degrees Plato by four.

Because the units for both Plato and Brix are grams/100 grams, they may be treated as percentages in calculations.

Source: The Oxford Companion to Beer

BREWING LOW-CAL & LOW-CARB BEERS

If, as I do, you need to control both calorie and carbohydrate intake, we have some tools in the box to control one or both of the factors. To lower overall calories, simply brew a lighter beer. Less original extract means fewer calories. You can brew some very flavorful low-alcohol beers such as an English mild, Piwo Grodziskie, session IPA, Kölsch, and more. You can control the carbs by managing the mash temperature (higher temperatures result in more carbohydrate but less alcohol and vice versa). You can also use enzymes to degrade the starches to sugars, which then are fermented to alcohol, lowering the carbs in the beer. For much more on this subject, refer to: https://byo.com/mr-wizard/crafting-low-carb-beers/

By knowing the macronutrients in beer and how to control them, a homebrewer can keep both the calories and carbohydrates to a level required for their dietary needs.

PIWO GRODZISKIE

(5 gallons/19 L, all-grain)
OG = 1.037 FG = 1.007
IBU = 30 SRM = 4
ABV = 3.9%

INGREDIENTS

7 lbs. (3.2 kg) oak-smoked wheat malt
0.6 lb. (0.27 kg) German pale ale malt
14 oz. (0.4 kg) rice hulls
5.6 AAU Saaz hops (60 min.)
(1.6 oz./45 g at 3.5% alpha acids)
7 AAU Saaz hops (0 min.)
(2 oz./58 g at 3.5% alpha acids)
Wyeast 1007 (German Ale),
White Labs WLP029 (German/
Kölsch Ale), or SafAle K-97
¾ cup table sugar (if priming)

STEP BY STEP

This recipe uses reverse osmosis (RO) water adjusted to 71 ppm Ca^{2+}, 33 ppm Mg^{2+}, 1 ppm Na^{+}, 124 ppm Cl^{-}, 202 ppm SO_4^{2-}, assumed 5 ppm hardness as $CaCO_3$, 1 mL 88% lactic acid or equivalent acidulated malt. The high magnesium level is characteristic of the water of Grodzisk, Poland.

Dough-in and rest using 4.5 gallons (17 L) of treated liquor for an hour at 150 °F (66 °C). Alternately, a step mash using the following steps may be used: 100 °F (38 °C), 30 min.; 125 °F (52 °C), 45 min.; 145 °F (63 °C), 45 min.; 158 °F (70 °C), 30 min.; 170 °F (77 °C), 10 min. mash-out. If desired, use a decoction to raise the mash temperature to the final step. Drain into kettle. Batch or fly sparge with 4-gallons (15-L) water at 170 °F (77 °C), run off to collect 6.75 gallons (26 L) of wort.

Boil the wort for 90 minutes assuming 1 gallon-per-hour (3.8 Liter-per-hour) boil-off rate, adding hops per the schedule. At 10 minutes, add 1 whirlfloc tab and 2 g yeast nutrient (optional). After the boil, give the wort a long stir to create a whirlpool and let settle for 20 minutes.

Chill to 60 °F (16 °C). If not using dry yeast, oxygenate or aerate. Pitch an adequate quantity of yeast. Ferment at 65 °F (18 °C) for three days or until half of fermentation is complete, then allow temperature to rise to a maximum of 68 °F (20 °C). After a short conditioning, prime and bottle or keg to 3.5 volumes CO_2.

NOTES:

Though possibly difficult to find, if available substitute Marynka hops for bittering and Lublin hops for flavor. Unfortunately there is no extract substitute for smoked malts available in most places.

Calorie calculation per 12 oz. (355 mL):
KcalAlc = 6.9 kcal / g x (0.79 g/mL x 3.9% ABV) x 3.5 = **74 Kcal**
RE = [(0.18 x 9.25 g/100g) + (0.82 x 1.75 g/100g)] = **3.1 g/100g**
KcalCarb = 4 Kcal/g x (3.1g/100g – 0.1g/100g) x 3.5 = **42 Kcal**
GCarb = 42 Kcal / 4 Kcal/g = 10.5 g
Kcaltotal = KcalAlc + KcalCarb = 74 Kcal + 42 Kcal = **116 Kcal**

DISTILLATION 101

WHEN BEER BECOMES BOURBON

by Aaron Hyde

There are few places in the world where home distilling is legal. I am lucky to live in one of them right now, New Zealand. I am from the United States where it is a federal crime, a felony, to distill spirits for consumption. I know plenty of people who have home distilled in the United States, but that does not make it any more legal. Keep local laws in mind as you journey ahead!

The art and science of distilling is what separates making beer from making whiskey. You might not realize it, but your beer is halfway to whiskey, the aged spirit of grain. Although numerous spirits can be made from grains like barley and corn, whiskey is the most recognized spirit that comes out of the still when you distill your beer, often referred to as a wash when it is coming out of the fermenter for distilling.

As a homebrewer, the addition of a still can add a bit of fun to the hobby of homebrewing. Let us look at what steps are needed to make whiskey, and more specifically Bourbon, the native whiskey of the United States, and get a general understanding of the process. Although this may not include everything you need to feel comfortable to start, I hope it gives you an idea of the process and what might be involved should you want to continue learning and make the leap into distilling.

Photo courtesy of Shutterstock.com

THE DISTILLING PROCESS

STEP 1: MASHING

If you're already a homebrewer, you know the mashing process is used on grains, which are sometimes referred to as cereals, to provide the brewer (or distiller) with simple sugars that can be eaten by yeast. Many different spirits can be made using grain, including whiskey. However, if you're drinking something like vodka or gin, it probably is made from plant-based, naturally occurring sugars, like those found in sugar beets and sugar cane, as this is the cheapest route. These sugars don't need to be mashed, saving you the time and energy of the mashing step.

The equipment you will need for mashing, which most homebrewers likely already have, includes:

- ☐ Long stainless steel spoon or mash paddle
- ☐ Pitcher for pouring water over grains for sparging
- ☐ Mash tun, at least 5 gallons (19 L)
- ☐ Sparge water heater (also known as a hot liquor tank)
- ☐ High-temperature silicone tubing
- ☐ Grain mill (optional)
- ☐ Heat source for heating your mash and sparge water
- ☐ Water source for mashing and sparging grain

STEP 2: FERMENTING

Turning sugar into alcohol is a critical step in the distilling process. While you can purchase beer, wine, or cider with the intent to distill it, these beverages were not made for distilling, so your results may vary. When you ferment your own alcohol, you have more control over the outcome. You will choose a yeast that is quite efficient at absorbing sugar and creating alcohol as a by-product. At times, you may choose a yeast to provide and emphasize flavors particular from the sugary mash product, while other times you may select a yeast to produce a clean, neutral flavor. Thus, by fermenting you are in the driver's seat during the creation of alcohol and the initial flavor development.

The basic equipment you need for fermenting your wash includes:

- ☐ Fermenter (at least 6 gallons, or 23 liters) with a lid or stopper
- ☐ Airlock
- ☐ Specific gravity hydrometer
- ☐ Racking cane with plastic tubing or auto-siphon with plastic tubing

STEP 3: DISTILLING

The distilling process itself is that one step unique to making spirits (as opposed to making beer), in that you are separating and then concentrating the alcohol. That's the basis of distillation — separate the alcohol from the water as vapor in the boiler of your still, and then recondense it into liquid in the condenser of the still for collection. Beer usually isn't over 15 percent alcohol by volume (ABV) for a reason: It hasn't been distilled. Most spirits are around 40 percent ABV, though sweetened aperitifs and liqueurs are often less. Let's assume you will use a still to do this, though there are other methods such as freeze distillation. Still types are covered in more depth in my book *How to Distill*, but you've probably seen one online, at a homebrew shop, or maybe on a distillery tour. It has:

- A boiler
- A closed dome or column on the top for some amount of refluxing (re-condensing of vapor inside the still)
- A condenser arm or tube that cools the vapor back to liquid form

The use of a still to perform distillation to concentrate alcohol is the biggest difference between making spirits and making beer.

The equipment you will need for distilling includes the following:

- ☐ Still (a pot still is preferred for whiskey)
- ☐ Proof and tralle hydrometer for measuring alcohol of spirit
- ☐ 12 to 15 collection jars (16 oz. or 500 mL) for making cuts
- ☐ Distiller's parrot or 8 oz./250 mL glass test jar (cylinder) for measuring your spirit proof

Photo from *How to Distill*

There are many stills on the market that vary in design and material. Research what will work best for your intended purposes.

CEREAL MASHING

Cereal mashing would be done before saccharification — the standard mashing process of converting starch into sugar. It's best to understand single-step, single-temperature saccharification mashing first. This can be performed as you would an all-grain beer, generally for distilling holding crushed malted grains in water between 145–150 °F (63–66 °C) for an hour. But, for many distillers who want to make grain-based spirit from raw, unmalted grains, as you often do to make Bourbon, an understanding of cereal mashing is needed.

Cereal mashing is a great technique to learn. It allows you access to any type of grain for distilling. Raw grain is often cheaper and sometimes more accessible than malted grain. Still a preferred method for some distillers, cereal mashing has been employed for a long time in distilling. It can be used to produce several spirits — Bourbon, corn whiskey, rye whiskey, gin, and vodka.

The process of cereal mashing can be a bit loose and varied, which also allows you to be less precise. So, if you understand the steps it takes, and follow trusted recipes at first, you'll get excellent results from cereal mashing unmalted grain.

Photo from *How to Distill*

Gelatinization is the first step in cereal mashing; releasing starch from the raw grains to create a porridge.

GELATINIZATION

Gelatinization is an important first step in cereal mashing to make the starch in raw grain readily available to enzymes. Oftentimes distillers refer to "cooking" their grains, and technically what they're doing is gelatinizing their grains. First, break or "crack" your grain through grinding or milling. Although difficult with raw grain that is quite hard or fresh grain with high moisture content, breaking your grain will make the process much quicker and easier, and may be required to access the starch inside some grains.

Adding enough water to cover the grain is the next step. The exact amount of water during gelatinization isn't so important. In my home kettle, I put about an inch (2.5 cm) of water above my grains. If you're looking for repeatability be sure to measure. Between 0.9–1.3 qts./L of water per pound (0.45 kg) of raw grain can be used as general guidance. As the heat rises in the kettle and the grains absorb water and swell, you may be left with a sticky mush that's hard to stir if there isn't enough water. It may thicken to the point that it scorches on the heat source. Always stir and add more water as you go, if needed.

Slowly bring up the temperature until gelatinization occurs, which is different for every grain. I recommend bringing your grains to a boil and then letting them cool as it speeds up the gelatinization process. Some grains such as wheat and rye don't actually need the high temperatures to gelatinize. Your porridge of water and grain should get gooey and thicken as the starch begins to break down. It thickens because the starch has been released into the water. As you stir, the porridge should start to cling to your mixing spoon but slide off, like runny yogurt, often leaving a starchy layer on the spoon. Now that you've achieved getting the starch out of hiding, you're ready for the next cereal mashing step: Liquefaction.

GRAIN	MINIMUM GELATINIZATION TEMPERATURE
Corn	170 °F (77 °C)
Barley	144 °F (62 °C)
Wheat	150 °F (66 °C)
Rye	142 °F (61 °C)
Oat	146 °F (63 °C)
Rice	180 °F (82 °C)
Potato	160 °F (71 °C)
Sorghum	167 °F (75 °C)

LIQUEFACTION

Liquefaction is literally the process of liquefying your starch. Liquefaction begins to break the starch down through alpha-amylase enzyme activity. Alpha-amylase is an expert cutter of long-chain starch molecules into smaller, more manageable sugars and dextrins. The alpha-amylase enzyme comes in different formats from different natural sources: Plants, bacteria, and fungi. Most are dried and powdered. All work well, but the most sought after are alpha-amylase that can work at high temperatures. These can be added during the gelatinization stage, and bringing your grains to a boil doesn't deactivate these enzymes. Lower-temperature alpha-amylase enzyme can also be used for saccharification. Notice it likes a lower pH, which can be good if you're trying to break down fruit. Medium temperature alpha-amylase enzymes are quite common and very general-purpose, often recommended for grains in the lower gelatinization temperature range, as it can liquefy as you gelatinize. High-temperature alpha-amylase is great for those grains that need a bit more heat to gelatinize.

You'll know when liquefaction has occurred when the stirring gets easier. A well-liquefied cereal mash will be easy to turn into simple sugar. Be patient: This process can take 20 to 30 minutes, or even up to two hours, so give it some time. Pro tip: Alpha-amylase is rather inexpensive and adding more will shorten the time.

SACCHARIFICATION

Saccharification is typically a single-temperature mashing step used to convert starch to sugars. The goal is to take your mixture of hydrolyzed starch, now in the form of dextrins from liquefaction, and make it into absorbable yeast food. Remember, without converting dextrins down further to simple sugars, the yeast can't create the ethanol we hope to collect and enjoy at the end of the distilling process.

At this point in cereal mashing, depending on your recipe, malted grain may be added for both its own starch and enzymes, and a standard saccharification mash at between 145–150 °F (63–66 °C) could be completed. Malted grain high in diastatic power (high in amylase enzymes) is needed to convert all the long-chain sugars in your cereal mash. This malted grain may just be called base malt, two-row malt, six-row malt, and, if it's really high in enzymatic activity, distiller's malt. A good rule is to add at least 30 percent or more malted barley to have ample enzyme activity able to convert dextrins to simple sugars. Not adding more grains? Another way to saccharify your mash is to add exogenous enzyme. There are numerous choices, with some working best at lower temperatures, often around 140 °F (60 °C) or less.

Glucoamylase (amyloglucosidase) enzyme is the most recommended enzyme for this last step in the cereal mashing process. It's extremely efficient and works in mashes that may be somewhat acidic. Beta-amylase is the common enzyme in barley and can also be found on the shelf in fungal form ready to be added to your mash. Depending on the number of enzymes, active saccharification can take anywhere between 20 to 90 minutes when using raw grain. As mentioned before, look to hold saccharification temperatures for about an hour, after which your starches should be fully converted to sugars. To finish mashing rinse your grain with hot water. From here you'll either boil to condense your wort or cool the wort down immediately for fermentation.

Photo from *How to Distill*

Blending cuts is a part of the art of distillation.

- ☐ Water source for condenser arm of still
- ☐ Heat source for still boiler
- ☐ Boil enhancers/chips (optional, for a more even boil)

If you're unsure about how or what from your cuts jars to blend, when doing a single distillation run it's a good idea to be more cautious and put less in from your heads and tails (roughly the top third and bottom third, respectively) than you'd estimate. A safe volume is 60% (though you could do less if you're not happy with the flavor of the jars) of what you collected, working from your middle jar. So, if you collected 10 jars, your six middle jars could be blended to form your whiskey for aging or drinking.

STEP 4: POLISHING

If you are looking for a nice, clean, and neutral-flavored spirit post-distillation then polishing is the answer. This filtration step can improve your spirit by taking out impurities created mostly during fermentation. If you are aging your spirit on oak, a small amount of these flavors can be good

so polishing might not be warranted! If not, they can leave a nasty off-flavor and aroma in your clear spirit. If you are careful how you collect your alcohol, leaving the heads and tails separate, you can blend these in post-distillation in smaller quantities that cut down on the harsh flavors, and maybe add some character to your spirit. Or, if you are making a whiskey that is going to be aged a long time, a polishing step can be less critical and likely not even necessary.

The equipment you will need for polishing (optional) includes:

- ☐ Activated carbon
- ☐ Carbon filter to hold the activated carbon
- ☐ Collection vessel for polished spirit

STEP 4: AGING

Aged or matured spirits are usually easy to identify. The yellow, amber, or brown color you see in spirits like whiskeys, rums, brandies, and tequilas comes from the aging process, usually from contact and time with toasted or charred oak or another type of wood. The burnt parts of the wood begin to color the spirit almost immediately and new bold and beautiful flavors like vanilla, caramel, and tobacco will develop in the spirit over time. At home, this can be done with charred oak chips, staves, or spirals in a glass jug or jar, or by putting your spirit directly in a small toasted or charred wooden barrel.

The equipment you will need for aging whiskey (like Bourbon) includes:

- ☐ Toasted or charred oak barrel (minimum 2 gallons or 6 to 8 liters) or oak chips, staves, or cubes
- ☐ Muslin cloth (or coffee filters)
- ☐ Glass aging vessel (if not using a barrel)
- ☐ Glass or stainless steel barrel thief or wine thief (for taking samples if using a barrel)
- ☐ Stainless steel racking cane and silicone tubing (for transfer if using a barrel)

STEP 5: BLENDING AND BOTTLING

There are numerous things you can still do after distilling, polishing, and/or aging to improve your spirits. The first that comes to mind is blending. Part art, part science, the title of master blender is a position at many large whiskey distilleries that takes years of apprenticeship and experimentation, learning the common flavors and off-flavors associated with distilling and aging — and really understanding your own palate. Honing your own sensory skills can be valuable to blending your own spirits. Obviously, to blend spirit, you'll need more than one around. This can be created from a single run by aging spirit on different types of charred or toasted wood, and at different ABVs. Multiple runs of whiskeys that are at different point in the aging process, or may be slightly different, will work well for blending.

Packaging your spirit in a properly corked, waxed, and labelled bottle may not be seen as critical by all in the hobby distilling community, but it is a nice touch. True, maybe you will decide your collection jug is the best final package for your spirit. However, the classic way to finish most spirits is a clear glass bottle (500 or 750 mL being common sizes), as a clear bottle offers a good look at the spirit itself.

The equipment you will need for

Photo from *How to Distill*

Discard the first 50 mLs out of your still — called the foreshots — which can contain methanol.

blending and bottling include:

- ☐ Glass or stainless wine thief
- ☐ Assorted small glass test jars or beakers
- ☐ Notepad
- ☐ Tasting glass
- ☐ 100 to 250 mL graduated glass test jar for blending
- ☐ Spirit bottles of your choice
- ☐ Glass or stainless pitcher or auto-siphon with silicone tubing (optional)
- ☐ Spirit bottle corks or caps
- ☐ Bottling wax and tin can for melting the wax (optional)
- ☐ Labels

Now that you've read a general overview of the process you might be quite interested in moving ahead with learning more and purchasing a still. A pot still will be a great way to go if you're interested in whiskey, and more specifically Bourbon whiskey, though other styles of still can work. A column still, which is quite easy to identify by its taller cylindrical column coming straight up off the boiler, offers more reflux than a pot still. Reflux is the process by which vapor rises in the still and recondenses inside the still falling back toward the boiler to be revaporized. This creates a higher proof alcohol from the still, but also strips the spirit of flavor. A pot still offers less reflux, which in turn means more flavor in your Bourbon. A simple way to begin is by investing in a small stovetop still, or by purchasing something like the Still Spirits Air Still. Most stovetop stills are a "pot still" as is the Air Still. If you brew beer using an electric brewing system (like those featured on pages 46–59 of this issue), consider seeing if still attachments are available. Some will allow you to mash grain and then pot distill with excellent control.

If you are unfamiliar with much of the distilling equipment mentioned, start researching. If you haven't yet purchased a still or are interested in digging deeper into the process, be sure to check out the book *How to Distill* from which the prior text and the following recipe are excerpted.

BOURBON-STYLE WHISKEY RECIPE

The difficulty in making Bourbon is mashing unmalted grain such as corn. Because it doesn't need a cereal mash, pregelatinized corn flakes are a great place to start, but it requires care and attention to the mashing process and effective use of enzymes to be the most useful as a provider of sugar to your wash. Rye malt is easier to manage than rye flakes in your mash, as rye flakes like to completely gelatinize, resulting in a "stuck sparge." The rice hulls are in the recipe to help alleviate this potential headache. If you'd like to use raw corn or rye in place of the recommendation in the recipe, be sure to cereal mash, as described earlier in the sidebar beginning on page 41. This recipe will make about 5 gallons (19 L) of wash:

- OG: 1.096–1.104
- FG: 1.000–1.010
- ABV: 12–13%

YOU WILL NEED:

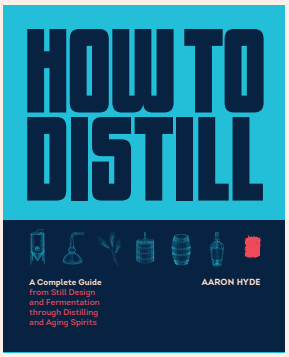
- 10 lbs. (4.5 kg) Briess Brewers Yellow Corn Flakes
- 6 lbs. (2.7 kg) Rahr High DP Distiller's Malt
- 2 lbs. (0.9 kg) Gambrinus Rye Malt
- 12 oz. (340 g) rice hulls (optional)
- 12 g Still Spirits Distiller's Glucoamylase Enzyme
- 20 g Still Spirits Whiskey Distiller's Yeast
- 2-gallon (6- to 8-L) medium toast or charred oak barrel, new or used for Bourbon (or 100 g medium toast oak chips)

STEP BY STEP

1. Add 6 gallons (23 L) of water to your mash tun and heat to 162 °F (72 °C).
2. Stir in all grains (and optional hulls) and hold the temperature at 148 °F (64 °C) for 60 minutes.
3. Let the temperature fall in the mash tun to 139 °F (59 °C). Stir 12 g glucoamylase into the mash.
4. Keep the mash between 123–139 °F (51–59 °C) for one hour.
5. Heat 2.2 gallons (8 L) of sparge water to 180 °F (82 °C) and sparge grain. ***Optional:*** *You may choose to bring the wort to a boil to ensure it is free from bacteria prior to fermentation and to condense it down (15 minutes is ample time to ensure a sterile wort, and up to an hour should be ample to condense wort to less than 5 gallons/19 L, should space in your fermenter or still be an issue). Neither is required if your equipment is clean and your fermenter is at least 6 gallons (23 L), large enough to manage around 5.25 gallons (20 L) of wort.*
6. Cool the collected wort and add to your fermenter.
7. Pitch yeast once the temperature is below 95 °F (35 °C).
8. Ferment at 72 °F (22 °C) for 14 days. Transfer the wash to your still.
9. Distill using a single run in a pot still or unpacked column still, or with three or fewer plates in a flute still. Discard the first 50 mLs out of your still. This is the foreshots and can contain methanol. Collect in bulk until your average collected spirit is 35 percent ABV (70 proof.)
10. Take 14 even cuts across your run (four 500 mL heads jars, six 500 mL hearts jars, four 500 mL tails jars).
11. Taste the heads, hearts, and tails to get familiar with their flavors.
12. Take just your hearts, and possibly some small portions of your heads and tails; no more than 12 oz. (355 mL) of either is recommended for your first Bourbon batch. Try to aim for a collected spirit between 50 and 62 percent ABV (100 and 124 proof) for aging. Add clean water if your collected spirit is higher.
13. Add it to a barrel or age on oak chips. A barrel allows for evaporation and oxygenation of the spirit, which helps develop flavor. This can be mimicked in a glass jar by leaving the lid slightly loosened for a few weeks, just be careful not to tip it over!
14. Age for a minimum of six months and, if possible, up to two years to make it "straight" Bourbon. BYO

Photo courtesy of Shutterstock.com

This article contains excerpts and images from the book *How to Distill* by Aaron Hyde, printed by Harvard Common Press and releasing November 2, 2021.



ELECTRIC COUNTERTOP BREW SY

We live in a technologically driven world where advances in automation replace labor-intensive and time-consuming tasks in just about every industry. The homebrewing hobby is no different, as new gadgets and equipment have come out to make brewing easier, more precise, and more repeatable. It's a trend we've seen for some time, but in the past decade it has taken a giant leap.

There may be no group of products that illustrate this better than electric countertop, all-in-one homebrewing systems. Like a coffee pot or toaster oven, these systems are becoming commonplace on homebrewers' kitchen counters or brew room tables. And it is easy to see why. They offer the same benefits of other methods of all-grain or extract brewing, just more conveniently in a single vessel, and with a smaller footprint.

Depending on the system, homebrewers can still be as involved in the process as they are on more traditional systems, or they can take a more hands-off approach and let the equipment do much of the work for them. With more than two dozen options available, homebrewers can determine what they hope to accomplish with an all-in-one system (which will most often perform a mash and boil, and in some cases cool, ferment, and even act as a serving vessel prior to self-cleaning) and choose one that meets their needs.

For the most part, these systems operate using a brew-in-a-bag/basket (BIAB) technique. The exact process recommended by the manufacturer can be found on their websites, but I'll give you a brief how-to in general terms (note that a few systems on this list are unique in how they create wort, and more details about the process those use is included in their specific write-ups on the following pages). To start the all-grain brew day, water is poured into the system and heated to a set temperature via electric heating elements. In a grain basket or bag the crushed grains are added when strike temperature is reached and the mash takes place as normal. Some systems include a pump to recirculate the wort, while others require mixing the mash by hand. Once the mash is complete the basket or bag is lifted (generally to rest on hooks while it drains), rinsed, and then removed — leaving the wort behind. The temperature is then programmed to boil and the boil proceeds as it would in any kettle. Post-boil is where there is more deviation in how the systems operate, as some include a way to chill the wort prior to being pumped or racked to a fermenter. Then there are some that don't even need to be transferred as fermentation takes place in the system. We'll get into those differences with each system.

Our extract brewing readership can have fun with these systems too. While they are often marketed toward all-grain brewing, most of these systems can be used in the same way an electric kettle would be. There are also a couple of systems specifically made for the extract-brewing crowd.

With that, let's dive into what makes these systems unique. We've also put together a chart comparing some of the most popular features side-by-side on pages 58–59.

STEMS

COMPARING WHAT'S ON THE MARKET TODAY

by Dawson Raspuzzi

Photo by Charles A. Parker/Images Plus

AIO

The AIO from Delta Brewing has a 10-gallon (38-L) total capacity with a recommended grain capacity of 7.5–18 lbs. (3.9–8.2 kg) to brew batches up to 6 gallons (23 L). The system includes a programmable controller with adjustable temperatures, timers, and alarms to alert the brewer when the next step should be taken, such as hop additions and transfers. The variable wattage heating elements go up to 1800W/110V. AIO comes with a magnetic drive pump for recirculation and a domed glass lid with a detachable circulation arm for regulating temperature during mashing. The grain basket is removable for sparging and cleaning. 304 stainless steel accessories, which all come standard, include a whirlpool arm, immersion chilling coil, hop spider, and mash paddle. The unit also comes with an insulation jacket to help maintain constant temperatures.

The AIO's heating unit takes about 32 minutes to raise the mash from 70 °F up to 152 °F (21 to 67 °C). It takes less than 40 minutes to get from mashing temperature up to boiling temperature.

Max Batch Size: 6 gal. (23 L) **Power:** 110V
Recipe Type: All-grain & extract

www.deltabrewingsystems.com/products/all-in-one

MSRP $484

BEERDROID

The BeerDroid from BrewArt is essentially a temperature-controlled fermentation vessel for extract brewing that also dispenses the finished beer. Brewing 2.6-gallon (10-L) batches, the BeerDroid is WiFi-enabled for firmware upgrades and their BrewArt App allows you to monitor and control the BeerDroid wherever you are. The machine features a no-thread tap system to allow for easy cleaning. The unit uses a quiet compressor for temperature control during fermentation and a backlit LCD screen that indicates what is happening inside.

The brewing process does not require mashing, lautering, or boiling, so your brew day is fast with minimal cleanup and minimal intervention. You can use one of their pre-packed BrewPrint recipe packs, or create custom recipes on their website. After the beer has completed fermentation you can bottle or keg the beer straight out of the BeerDroid tap. Or, if you purchase it separately, the beer can be transferred to the BrewFlow, a temperature-controlled dispensing system that will allow the beer to never be introduced to oxygen until it is poured. Instructional videos for using the BeerDroid and BrewFlow are available on the BrewArt website.

Max Batch Size: 2.6 gal. (10 L) **Power:** 110V or 240V
Recipe Type: Extract

store.brewart.com/beerdroid

MSRP $499

BEERMKR

BEERMKR mashes, ferments, and comes with a BEER TAP that carbonates and serves your homebrew from a plastic pouch. The system produces about 1.2 gallons (4.4 L) of beer per batch. BEERMKR has an array of heating/cooling elements and sensors to ensure precise temperature control down to lagering temperatures with +/- 0.5 °F (0.3 °C) accuracy. Since it is Wi-Fi enabled, the brewer can track progress on the BEERMKR app, which sends notifications for each next step.

Unique to this system is the boil step is replaced with a 24-hour mash, where hop bitterness comes from Steam Hops that have been pre-boiled to match the flavor profile and bitterness of 15/30/60-minute boil additions. After mashing grains in the brew basket, all of the action takes place in an impermeable plastic bag with ports at the top and bottom for wort to enter and for yeast and trub to settle out. The bag is then moved to the BEER TAP for carbonation using a CO_2 canister. Chilling the beer to serving temperatures requires moving the BEER TAP to a refrigerator and it is then served via a cobra-style tap. All of the parts that come into contact with the beer/grains are dishwasher safe.

The BEERMKR store has a handful of recipe kits (and the first is included with the system).

Max Batch Size: 1.2 gal. (4.4 L)
Power: 100–240V
Recipe Type: All-grain

www.beermkr.com

MSRP $579

BRAUMEISTER

First released in 2003, Braumeister is one of the original countertop all-in-one mash/boil systems. The team at Speidel has made improvements along the way, including brand new features in their latest iteration released earlier this year. Coming in three sizes to meet any homebrewer's needs, the Braumeister features an automatic step mash controlled over Wi-Fi. Its control panel has a 5-inch (12.5-cm) LED touchscreen with mirrorless view that is impervious to water contact. It allows for easy recipe selection, as well as a memory bank to store recipes for future brews.

Some of the newest features include a welded on double jacket that can be used to cool the wort after boil. Another new optional feature is a lid with clamping ring that allows fermentation to take place in the Braumeister (if you go this route, the temperature can also be controlled with the welded double jacket as well). The temperature sensor has also been moved from the bottom of the unit and installed in the center tie rod to get a more accurate reading. It now also has Bluetooth capability to work with the Tilt Hydrometer, a timer function for delayed starts to your brew day, and the ability to change brewing settings such as time and temperature after beginning.

Max Batch Size: 2.6 gal. (10 L), 5.2 gal. (20 L), 13.2 gal. (50 L)
Recipe Type: All-grain & extract
Power: 230V

www.speidels-braumeister.de/en/braumeister.html

MSRP $1,788.99 (2.6 gal./10 L)

MSRP $1,999 (5.2 gal./20 L)

MSRP $2,999.99 (13.2 gal./50 L)

BREW-BOSS

Coming in 15- and 20-gallon (57- and 76-L) pot options, the Brew-Boss system comes with a Wi-Fi enabled controller that connects to the Brew-Boss app where brewing steps can be modified by the user in manual mode. If less control is desired it can be programmed to automatic mode. The controller interacts with the electric heating element, a high-temperature circulation pump, and an optional automatic hopping device called the Hops Boss® and optional kettle filler called the Accu-Fill®.

The most unique feature is the patent-pending COFI (center out forced infusion) filter in which water/wort is continuously pumped from the bottom of the kettle during the mash and through a central infusion tube, where it is forced outward in all directions through the grain bed to assure the grain is in constant contact with the mash liquid. When the mash is over the filter is lifted and the grain gets squeezed to extract the liquid before boiling begins using the 5500W heating element.

Entirely stainless steel, the kettle is custom designed and equipped with TIG welded tri-clamp type ferrules for the heater and valve. Brew-Boss has both an Android and iOS app, but only the Android version allows recipes designed on BeerSmith to transfer to the app to automatically create brew programs.

MSRP $1,499 (15 gal./57 L)

Max Batch Size: 10 gal. (38 L), 15 gal. (57 L)
Recipe Type: All-grain & extract
Power: 120V or 240V

MSRP $1,569 (20 gal./76 L)

www.brew-boss.com

BREWER'S EDGE MASH & BOIL

The Brewer's Edge Mash & Boil from William's Brewing has one of the lowest price points of all the systems on our list. It doesn't have some of the flashy features other units include, but it includes all of the necessities to brew 5-gallon (19-L) all-grain batches with a grain capacity of up to 16 lbs. (7.3 kg). It features a delayed start timer that can be set 24 hours in advance. The system features a double wall stainless construction that conserves heat to achieve a rolling boil with 110V and 1600W.

After setting the strike water temperature to 162 °F (72 °C) (it will drop to about 152 °F/67 °C after adding the grains) it will take about 40 minutes for room temperature water to get up to temperature. You can then set the temperature to your desired mash temperature (it will stay within about 3 °F/1.5 °C of expected) and come back an hour later. The mash basket includes locking legs to allow the grains to drip back into the kettle for the boil. It will take another 40 minutes to get the wort up to a boil. The unit has a stainless valve with ½-inch hose barb to transfer wort or manually recirculate your mash using a pitcher.

For an additional $50 homebrewers can upgrade to a unit that comes with a pump for recirculation during the mash. William's Brewing provides a 2-year warranty on the Brewer's Edge.

Max Batch Size: 5 gal. (19 L)
Recipe Type: All-grain & extract
Power: 110V

MSRP $299.99 ($349.99 with pump)

www.brewersedge.com

BREWTOOLS

Brewtools comes in a couple of sizes to fit homebrewer's needs: The B40pro (10.5-gal./40-L volume and 20 lbs./9 kg of grain capacity) and the B80pro (21-gal./80-L volume and 44 lbs./20 kg grain). For the rest of this overview we'll focus on the smaller system, the B40.

These units contain many of the extra bells and whistles that some homebrewers desire, starting with a conical bottom with center draining and a powerful control system with a 7-inch touch-screen that is WiFi- and Bluetooth-enabled. A pump can be controlled by the touch-screen. The wort is circulated up through the center-pipe and the pump is fitted using tri-clamps for easy removal even when the tank is full. The included circulation device can be used for clean-in-place, making cleanup a breeze. Two temperature sensors, located at the bottom of the tank and before the pump, can be individually calibrated for maximum accuracy, which is advertised as +/- 0.2 °F (0.1 °C) accuracy.

With heating elements combining over 3,2kW (230V) of power, heating water or wort is very fast. The maximum current of each mains input can be adjusted to 10, 13, 15, and 16 Amps. All ports are 34mm tri-clamp fittings. Included silicone tubes are 16x25mm food-grade silicone.

MSRP $1,569 (10.5 gal./40 L)

Max Batch Size: 9.2 gal. (35 L), 18.5 gal. (70 L)
Recipe Type: All-grain & extract
Power: 110V or 240V

www.brewtools.us

MSRP $1,999 (21 gal./80 L)

BREWVIDE™

Essentially a sous vide on steroids, the BrewVide™ All-In-One Kit from Vessi is the newest automated system on the market, having topped its $100,000 funding goal on Kickstarter within 48 hours earlier this summer. The BrewVide™ features built-in dual heating elements delivering up to 1600W of power with a standard 120V outlet, which will bring wort from mash temperatures to a boil in about 40 minutes. It also features an integrated magnetic drive pump that moves up to 3 gallons (11.5 L) per minute for stirring the mash, whirlpooling, and transferring wort to a fermenter after chilling. The All-In-One Kit also includes a 10-gallon (38-L) BrewBuilt™ kettle with tri-clamp fittings and lid, custom neoprene kettle insulation sleeve, immersion chiller, and cloth brew bag.

The unique design requires the BrewVide™ to be placed on the rim of the kettle, with the controls hanging over the outside of the kettle and the pump/heating element hanging into the mash/wort. It is designed to do full-volume, no-sparge, all-grain mashes with around 7 gallons (26.5 L) of strike water and up to 15 lbs. (6.8 kg) of grain.

Through the BrewVide™ app (iOS and Android) you have the ability to create schedules, set temperatures, and monitor your brew. The BrewVide™ will be shipping by April 2022, but orders are being taken now.

Max Batch Size: 5 gal. (19 L)
Recipe Type: All-grain & extract
Power: 120V

https://www.getvessi.com/pages/brewvide

MSRP $759

BREWZILLA

The Brewzilla from Australia's KegLand comes in two sizes: A 9.25-gal. (35-L) capacity (110V and 220V options available) and a 17-gal. (65-L) capacity system. While this is a budget-friendly system, it still includes a lot of great features such as the control panel that can be set to do up to six automated step mashes and a delay start timer through the digital backlit display. The system also includes an immersion chiller that comes standard and can be run immersed in the wort or hooked up to the sparge arm using a piece of included silicone and placed in a bucket of ice water with wort recirculating through it for faster, more efficient chilling. Feet at the base of the malt pipe allow it to sit on the kettle to drain when the mash is complete.

Features new in the third generation include an ultra low watt density dual element control (1900W and 500W), a more heavy-duty ½-inch cam-lock fitting on the sparge arm, thicker stainless steel malt pipe, and a double mash screen for improved flow. The BrewZilla has a ½-inch ball valve with 13 mm barb fittings for wort transfer and a magnetic drive pump mounted in the base. It also includes a third handle for easy pouring. The Brewzilla is available in the U.S. through MoreBeer!

MSRP $449.99 (110V, 9.25 gal./35 L)

MSRP $479.99 (220V, 9.25 gal./35 L)

MSRP $699.99 (17 gal./65 L)

Max Batch Size: 8 gal. (30 L), 15 gal. (57 L)

Recipe Type: All-grain & extract

Power: 110V, 220V

www.kegland.com.au/brewzilla-35l-gen-3-1-1.html

CLAWHAMMER SUPPLY ELECTRIC HOME BREWING SYSTEM

Clawhammer Supply has two versions of their Electric Home Brewing System to meet your power needs — a less expensive version that runs on 120 volts with a detached 15 amp PID digital controller and 1650 ultra low watt density heating element. The 240 volt option comes with a 30 amp controller and 5500 ultra low watt density heating element. The features are otherwise identical, featuring 304 stainless steel throughout and a removable temperature probe. It has a 10.5-gallon (40-L) kettle and removable grain basket that holds up to 20 lbs. (9 kg) of grain to brew batches up to 5.5 gallons (21 L). Following the mash, the basket can be lifted to conveniently sit on three grain basket clips over the kettle. The digital controller features automated temperature control and pump operations so you can sit back and let the system do its thing after manually programming it.

Setting Clawhammer's system apart from many other electric systems are features that come standard including a heavy-duty pump, highly efficient flat plate heat exchanger, stainless steel hop basket, and quick release hose fittings. All of the tri-clamps, valves, hoses, and fittings are included.

MSRP $899 (120V)

MSRP $1,499 (240V)

Max Batch Size: 5.5 gal. (21 L)

Recipe Type: All-grain & extract

Power: 120V or 240V

www.clawhammersupply.com

DIGIBOIL

The DigiBoil All-Grain Electric Brewing System is the more economical offering from Australia's Kegland (sold under the name DigiMash in the U.S. through MoreBeer!). It is available in both 9.25-gallon (35-L) 110V and 17-gallon (65-L) 220V stainless steel options. To save costs it lacks some of the features found in the BrewZilla, such as the chiller, however it comes with everything needed to mash and boil in one unit. The digital controller is one of the big differences between the DigiBoil and BrewZilla, where you lose the option of delayed starts and programming step mashes in this system. Step mashes are still possible by adjusting the temperature manually on the controller. Another big difference is the Digiboil does not come with a pump. Users can use an external pump to increase efficiency of the mash (by connecting a ball valve to the inlet of your pump and then connecting the outlet of the pump to a sparging system), or stir the mash with a paddle. The smaller DigiBoil system comes with two built-in heating elements that run off a 110V plug and can be individually controlled. One element is 1000W and the other is 500W. The larger DigiBoil includes a third heating element for a combined 3500W of power.

MSRP $229.99 (9.25 gal./35 L)

Max Batch Size: 8-gal. (30-L), 15 gal. (57 L)

Recipe Type: All-grain & extract

Power: 110V, 220V

MSRP $650 (17 gal./65 L)

www.kegland.com.au/35l-digiboil-digital-turbo-boiler-2400watt.html

FOUNDRY

The Foundry from Anvil Brewing Equipment comes in two sizes — a 10.5-gallon (40-L) option that holds up to 16 lbs. (7.3 kg) of grains for brewing 5-gallon (19-L) batches and a 6.5-gallon (25-L) option for brewing batches up to 3 gallons (11.5 L) with 8 lbs. (3.6 kg) of grain. Both include the same features, including a triple element, low watt density dual-voltage heaters, and a unique high-flow grain basket.

The Foundry can run on 120V/1600W/13A or 240V/2800W/12A power to meet your needs. The high-flow grain basket is advertised to have more perforations to "virtually eliminate stuck mashes," which they do by including perforations part way up the sides of the basket in addition to the bottom. The system also comes standard with a high-capacity stainless immersion chiller with the required fittings and hoses. It features a backlit digital display and PID controller that can be set for delayed brewing. The Foundry includes a rotating racking arm for easy racking of the wort while leaving the trub behind by adjusting its height.

The base models do not include a pump for recirculation, however, the option for adding an Anvil recirculation pump kit is available for an additional $100 for either size. Anvil also sells a condenser for distilling, which works with the Foundry.

MSRP $289 (6.5 gal./25 L)

Max Batch Size: 3 gal. (11.5 L), 5 gal. (19 L)

Recipe Type: All-grain & extract

Power: 120V, 240V

MSRP $399 (10.5 gal./40 L)

www.anvilbrewing.com/category-s/127.htm

GIGAWORT

The Gigawort from Northern Brewer is an electric kettle with a 4.4-gallon (16.7-L) capacity. Given the smaller size than most systems on this list, it is ideal for small batches and partial-volume boils for brewing extract and partial mash recipes. While it is not the intended purpose, with the addition of your own grain bag you could brew 3-gallon (11.5-L) BIAB recipes with it as well, as homebrewers have done. It has an integrated digital control for heating, which also allows for delayed brewing. Using a 120V outlet, it features a dual element that can run on 1600W for heating to a boil and 600W for maintaining a boil. The system is double-walled 304 stainless steel to help efficiently maintain temperatures in the kettle. It also features a patent-pending "iso-flow bulkhead and dip tube" that is advertised to make wort transfers easier by eliminating the need to lift and pour the wort from the Gigawort into a fermenter.

Max Batch Size: 3 gal. (11.5 L) **Power:** 120V
Recipe Type: All-grain & extract

www.northernbrewer.com/products/gigawort-electric-boil-kettle

MSRP $174.98

GRAINFATHER G30

The Grainfather G30 is one of the most popular all-in-one systems. With a 7.9-gallon (30-L) capacity, you can make up to 6.07 gallons (23 L) of beer per batch.

The Grainfather has been engineered with 304-grade stainless steel, tempered glass, a magnetic drive pump (6W, 1800 RPM), and copper cooling coils. It has an expandable grain basket to suit grain bills up to 19.8 lbs. (9 kg) allowing you to produce brews with higher ABV (up to 10%) as well as lower ABV beers. The temperature-controlled heating elements allow you to set mash temperatures without fluctuation. Heating from mash to boil takes as little as 20 minutes.

The G30 includes a counterflow wort chiller, allowing you an easy and sanitary process for transferring your cooled wort to a fermenter. It can cool a full batch to less than 68 °F (20 °C) within 20–30 minutes.

The control box has Bluetooth connection to your mobile device, allowing for remote control via the Grainfather app. The app also has hundreds of recipes for you to choose from (and where you can share your recipes) and the G30 will guide you through each step of the brewing process.

Max Batch Size: 6.07 gal. (23 L) **Power:** 110V or 220V
Recipe Type: All-grain & extract

www.grainfather.com

MSRP $999

HIGH GRAVITY WORT HOG BIAB

Every High Gravity Wort Hog system sold is custom built at the time of ordering with several configuration options, which allows it to be one of the most customizable on the market for homebrewers looking for particular features and upgrades. Two sizes are available: An 11.6-gallon (44-L) Bayou Classic kettle for 5-gallon (19-L) batches and a 16.4-gallon (62-L) Bayou Classic kettle for brewing 10-gallon (38-L) batches.

The smaller size comes with a stainless steel basket as well as a 15-gallon (57-L) BrewBag fabric filter. It features the Blichmann BoilCoil 120V-heating element (2250W) and the High Gravity Wort Hog EBC-130 120V-heating element with an integrated PID controller for precise automatic temperature control. The Topsflow TD5 DC SS inline pump comes standard for recirculation but an upgrade to the Blichmann Riptide pump is available. A stainless temperature probe, silicone tubes, cam locks, and hose clamps all come included. The unit heats 8 gallons from mash temperature to a boil in about half an hour.

The larger system runs on 220V with a Blichmann BoilCoil 15-gallon (57-L) heating element (4500W). It comes with a polyester bag for BIAB, but the basket is an available upgrade. You can also upgrade to a Spike or Spike+ kettle, if desired.

MSRP $999 (11.6 gal./44 L)

Max Batch Size: 5 gal. (19 L), 10 gal. (38 L)

Recipe Type: All-grain & extract

Power: 120V, 220V

www.highgravitybrew.com

MSRP $1,014 (16.4 gal./62 L)

KLARSTEIN

The German company Klarstein has a half dozen electric single-vessel systems that are popular in Europe and starting to become more available in North America, with two currently available on Amazon. The systems, each with a different name, vary in size from 7.9–18.5 gallons (30 to 70 L). The most basic, the Beerfest Mash kettle, retails for 149 € and features the bare minimum accessories to brew beer in the stainless kettle with a port on the bottom — temperature control knobs to run the 2585W heating element, a mesh brewing bag, strainer to filter the mash, and a power switch.

On the top end of is the Brauheld Pro Mash Kettle (649.99 €), which is an 18.5-gallon (70-L) stainless kettle with a recirculation pump, LC display and cable connections, and 11 programmable mashing steps. You can also program up to nine recipe memory locations and it comes with four preset recipes for different beer styles. It has a removable grain basket with a sieve insert and comes with a tempered glass lid. The heating element can be adjusted from 100 to 3300W of power.

Between the Beerfest and Brauheld are the Füllhorn, Maischfest, Mundschenk (pictured), and Cupbearer systems, which include an increasing number of features. Find more on each at the Klarstein website.

Max Batch Size: 5–12 gal. (19–45 L)

Recipe Type: All-grain & extract

Power: 220–240V

www.klarstein.co.uk/

MSRP 149–649.99 Euro

MINIBREW

The MiniBrew is an all-in-one system ideal for those looking to make small batches in a rather hands-off approach. The mini all-grain system heats water, mashes, recirculates, sparges, boils, chills, cleans, ferments, and dispenses your homebrew from the same piece of equipment that has a coffeemaker-type of aesthetic design.

After adding all of the ingredients, this small-batch brewing machine will boil and cool the wort. All of the hops are added in a hop carousel, which are then automatically added to the boil at the pre-set times. All of the brewing steps can be set and followed on the MiniBrew app (or a QR code can be scanned if using a kit that will automatically program the system for the appropriate steps). Fermentation is also done automatically in the same copper keg vessel. Brewing takes around four hours and then 10–36 days later the beer is ready to enjoy. Additional kegs can be purchased if you want to brew another 1.3-gal. (5-L) batch before emptying the first. The clean-in-place system makes cleaning a breeze.

Using the MiniBrew software is applicable for brewers of all experience levels. A starter can order one of the 20 recipes available through the app. Or brewers can start a pro membership where they can create their own recipes and use their own ingredients, or brew some of the 5,600-plus recipes created and shared by users on the app.

Max Batch Size: 1.3 gal. (5 L) **Power:** 220-240V
Recipe Type: All-grain

www.minibrew.io

MSRP $1,090

SPIKE SOLO

Designed to be compact and turnkey, the Spike Solo can get you brewing a batch of beer minutes after opening the box. The unit comes in three sizes — 10, 15, and 20 gallons (38, 57, and 76 L) that can be used to brew batches from 5 to 10 gallons (19 to 38 L) and hold from 12–40 lbs. (5.4–18 kg) of grain. Each uses a 240V element (the 10-gallon/38-L can be purchased at 120V as well). The 240V system produces 5500 watts of heating power while the 120V produces 1350W.

The Spike Solo is made entirely of 304 stainless steel with 1.2 mm thick walls. It comes standard with NPT fittings, however for $150 more the Spike+ Solo can be purchased with tri-clamp fittings. Thick stainless steel hooks on the basket allows it to rest on the kettle lip during vorlauf or while the basket drains. The tapered basket also features precision-lasered slits matching the false bottoms on Spike's commercial brewing systems. The Solo's control panel is made with professional-grade components, including many of the same ones from the panels in Spike's pro-grade nano systems.

Optional additions include the pump for recirculation as well as a chiller.

Max Batch Size: 5 gal. (19 L), 8 gal. (30 L), 10 gal. (38 L) **Recipe Type:** All-grain & extract
Power: 120, 240V

www.spikebrewing.com/pages/spike-solo

MSRP $1,525 (10 gal./38 L)

MSRP $1,625 (15 gal./57 L)

MSRP $1,725 (20 gal./76 L)

Ss BREWTECH EBREWING 1V SYSTEM

Coming in 10-gallon (38-L) and 20-gallon (76-L) options, this system includes an eController 1V, eKettle with element, and a silicone mat. To use as a single-vessel BIAB system a user would have to supply a bag.

The custom-designed low-watt density heating element is a circular "halo" design specifically sized for the corresponding kettle to evenly distribute heat. The circular 5500W Incoloy 800 alloy element is advertised to allow for a better whirlpool and trub cone formation, and is removable for cleaning. The eControllers include a fully proportional PID output, allowing voltage to be adjusted from 0–100% for holding temperatures steady during a mash rest or dialing in an ideal boil temperature. Both the element and controller are sized to maximize a standard 240 VAC, 30A residential circuit for quick ramp times. All of the tri-clamp fittings are welded, as is a trub dam that is paired with a 1.5-inch ball valve. The kettle features an integrated PT100 temperature probe.

The system allows for flexibility by using common connectors in the Ss eController and eKettle that, with the modularity of the eBrewing system, allows a user to splice a hot liquor tank or boil kettle into their existing system, for instance, without having to purchase an entire three-vessel brewhouse.

MSRP $979 (10 gal./38 L)

Max Batch Size: 5 gal. (19 L), 10 gal. (38 L)

Recipe Type: All-grain & extract

Power: 240VAC

MSRP $1,079 (20 gal./76 L)

www.ssbrewtech.com/collections/ebrewing-kits/products/ebrewing-1v-kit

UNIBRAU

The Unibraü from Bräu Supply comes with standard options, premium options, and is also customizable to meet any homebrewer's needs. Let's start by looking at the base systems, which come with 10-gallon (38-L) and 20-gallon (76-L) kettle sizes. Each includes the stainless steel grain basket, a stainless plate chiller, and commercial brewery-grade disconnects throughout the system for easy assembly, cleaning, and integration with an existing brewery if you choose.

The 10-gallon (38-L) size comes with 120V or 240V compatibility. Standard with the 120V system is the ETC controller that measures temperatures to within 0.1 °F/°C, a 1650W element, a high-temperature magnetic drive pump, and a grain basket lid. Step up to the Premium option and you get an upgraded EZboil PID controller, butterfly valves, a counterflow chiller with quick disconnects, a 1650W element upgrade kit for a total of 3300W of power, hopBlock filter and diptube, whirlpool arm, sparge arm, and more.

The 10-gallon (38-L) 240V and 20-gallon (76-L) 240V systems come with a 5500W element and EZboil 30A controller. All of Unibraü's systems come with a full 12-month warranty and are customizable.

Max Batch Size: 6 gal (23 L), 15 gal. (35 L)

Recipe Type: All-grain & extract

Power: 120V, 240V

MSRP $1,199–$2,275

https://brausupply.com/products/unibrau-all-in-one-electric-brew-system

COUNTERTOP CHART

SYSTEM	PRICE	MAX BATCH SIZE U.S. GAL. (L)	POWER	ALL-GRAIN	EXTRACT	RECIRCULATES WORT
AIO	$484	6 (23)	110V	✓	✓	✓
BeerDroid	$499	2.6 (10)	110V/240V	✗	✓	✗
BEERMKR	$579	1.2 (4.4)	100–240V	✓	✗	✗
Braumeister	$1,788.99–$2,999.99	2.6–13.2 (10–50)	230V	✓	✓	✓
Brew-Boss	$1,499–$1,569	5–15 (19–57)	120V/240V	✓	✓	✓
Brewer's Edge Mash & Boil	$299.99	5 (19)	110V	✓	✓	O
Brewtools	$1,569–$2,799	9.2–18.5 (35–70)	110V/240V	✓	✓	✓
BrewVide	$759	5 (19)	120V	✓	✓	✓
BrewZilla	$449.99–$699.99	8–15 (30–57)	110V/220V	✓	✓	✓
Clawhammer EBHS	$899–$1,499	5.5 (21)	120V/240V	✓	✓	✓
DigiMash	$229.99–$650	8–15 (30–57)	110V/220V	✓	✓	✗
Foundry	$289–$399	3–5 (11.5–19)	120V/240V	✓	✓	O
Gigawort	$174.98	3 (11.5)	120V	✓	✓	✗
Grainfather	$999	6.07 (23)	110V/220V	✓	✓	✓
High Gravity BIAB Electric	$999–$1,014	5–10 (19–38)	120V/220V	✓	✓	✓
Klarstein	149–649.99 €	5-12 (19–45)	220–240V	✓	✓	Some models
MiniBrew	$1,090	1.3 (5)	220–240V	✓	✗	✓
Spike Solo System	$1,525–$1,725	5–10 (19–38)	120V/240V	✓	✓	O
Ss Brewtech eBrewing 1V	$979–$1,079	5–10 (19–38)	240VAC	✓	✓	✗
Unibräu	$1,199–$2,275	6–15 (23–35)	120V/240V	✓	✓	✓

O = Optional Accessory

BOILS	CHILLING	FERMENTS	DISPENSES	CLEAN-IN-PLACE	WI-FI ENABLED	DISTILLATION COMPATABLE
✓	✓	✗	✗	✗	✗	✗
✗	✓	✓	o	✗	✓	✗
✗	✗	✓	✓	✗	✓	✗
✓	✓	o	✗	✗	✓	✗
✓	✗	✗	✗	✗	✓	✗
✓	✗	✗	✗	✗	✗	✓
✓	✗	✗	✗	o	✓	✗
✓	✓	✗	✗	✗	✗	✗
✓	✓	✗	✗	✗	✗	✓
✓	✓	✗	✗	✗	✗	✗
✓	✗	✗	✗	✗	✗	✓
✓	✓	✗	✗	✗	✗	✓
✓	✗	✗	✗	✗	✗	✗
✓	✓	✗	✗	✗	✗	✓
✓	✗	✗	✗	✗	✗	✗
✓	o	✗	✗	✗	✗	✗
✓	✓	✓	✓	✓	✓	✗
✓	o	✗	✗	✗	✗	✗
✓	✗	✗	✗	✗	✗	✗
✓	✓	✗	✗	✗	✗	✗

ALL ABOARD FOR GOURDS

Brewing with pumpkins and squash

by Gordon Strong

Pumpkin beers get a bad rap nowadays. I think it's a natural backlash to over-exposure, since they went from a highly-anticipated fall seasonal beer to a faddish trend about ten years ago. Many breweries jumped on the bandwagon looking to cash in on the latest craze, and a lot of commercial products were ill-conceived and poorly executed. I think the "jump the shark" moment came when Budweiser mocked craft beer in a 2015 Super Bowl ad showing hipsters fussing over their tasting glasses of pumpkin peach ale. Never mind that Anheuser-Busch had recently bought Elysian Brewing, who actually made a Georgia-inspired pecan peach pumpkin amber ale. Oops.

I was a judge at the Great American Beer Festival later that year, and was amused to see so many pumpkin peach beers on the festival floor. But that was a one-time display of irony, not to be repeated in subsequent years. It was kind of like brewers got a pass that year to try something really experimental. I remember asking several brewers whether they were being serious or if it was just a joke. Most were jokes.

Photo Illustration by Charles A. Parker/Images Plus

Photo by Shutterstock.com

Pumpkin beers have evolved over the past decade from standard-strength malty amber beers to examples that are bigger, darker, stronger, and more assertive.

Now that the trend-chasers have moved on to seltzier things, pumpkin beers have evolved a bit from their roots as standard-strength malty amber beers to bigger, darker, stronger, and more assertive creations. The original pumpkin beers remain, but the concept has broadened to encompass more base styles and variations. In a way, this is showing that pumpkin can be a mainstream ingredient, although it does retain its autumn seasonal association.

WHAT ARE GOURDS?

When brewing, we talk about pumpkin primarily, but all the guidance applies to other field vegetables related to gourds. Gourds can be ornamental or decorative, or can be edible in thin-skinned summer or hard-skinned winter versions. While they are botanically fruits of flowering plants, they are culinary vegetables of the family *Cucurbitaceae,* which also includes things like cucumbers and melons. The genus *cucurbita* (Latin for gourd) includes many of the common squashes originating in Central and South America.

The terms gourd, squash, and pumpkin are often used interchangeably, but gourds are the broadest concept, and also include non-edible varieties. Squash is basically another name for gourd, but in common usage often implies edible varieties. Pumpkins are a type of squash, and there are many varieties of each. From a brewing standpoint, they can be used in the same ways so we won't really carry on this distinction without a difference.

RECIPE STRATEGIES

When brewing with gourds, there are several recipe choices to make that influence the finished beer. Will you use pumpkin or some other gourd? Will it be spiced or not? What is the base style, if any? Is there any other special ingredient or process involved? These choices inform the form of ingredient used and the process choices. As with most brewing decisions, there is no one right way to use gourds and opinions from experts differ. However, that doesn't mean anything goes — poor decisions will still lead to dubious results. Forming a mental image of the end result is often my first step in conceptualizing the recipe.

Squashes can often lack significant flavor of their own. Much of what people think of pumpkin pie flavor is carried by the spice and sugar combination. Some heirloom gourd varieties may have greater flavor (just like tomatoes and other vegetables do). The flavors can be enhanced with additional processing, such as roasting, which can add caramelization. Gourds to me seem to add a mouthfeel effect, a fuller and slicker taste, and can often add color; I like the orange-ish tint from pumpkin.

For a broader perspective, I spoke with Will Meyers of Cambridge Brewing Company in Cambridge, Massachusetts about his experiences. I've long been a fan of his work, and have fond memories of the wide range of gourd-based beers at his fall festival. I had also previously spoken with Dick Cantwell, formerly of Elysian Brewing Company in Seattle, Washington about his use of pumpkin. These two professional brewers were among the pioneers and biggest promoters of pumpkin beers on the East Coast and West Coast, respectively.

Will Meyers loves using heirloom variety pumpkins and squashes, locally sourced from farms in eastern Massachusetts. He likes Blue Hubbard squash, Grey Ghost pumpkins, Honeynuts, Long Island Cheese pumpkins, and Red Kuri. Butternut squash, Kabocha squash, and sugar (pie) pumpkins are more available choices when heirloom varieties are unavailable. He recommends scouring local farmer's markets in season, talking to the growers, and perusing seed catalogs for ideas and descriptions. Generally, pumpkins that are deeply-colored, densely-fleshed, and have a reputation for creaminess, sweetness, and depth of flavor produce better results. It's good to have these factors in mind when seeing what is available in your area.

I've used butternut squash, acorn squash, calabaza from Latin markets, and pie pumpkins. I treat them all the same — split in half, scoop out the seeds, and roast in a 350 °F (177 °C) oven until soft (about an hour, typically). Then I scoop out the flesh and use it in my recipe. If I can't get fresh pumpkins, I use canned pumpkin puree, but be sure it is unspiced and 100% pumpkin. Dick Cantwell uses pumpkin puree often, but Will Meyers prefers to shred uncooked (raw) pumpkin and use that only in the mash. Just don't use field pumpkins; you know, the kind that are carved as jack-o-lanterns for Halloween.

When I use commercial canned pumpkin puree I like to caramelize it in the oven, which deepens the color and flavor as well as removing some of the water content. I roast it in a 400 °F (204 °C) oven for 60 to 90 minutes, turning it every 15 minutes, and watching it to prevent burning.

Browning in general develops flavors in food but blackening creates unwanted burnt, bitter, harsh flavors. Golden brown is almost always a desirable stage of color development.

Many brewers use commercial pumpkin pie spice in their beer successfully, but I prefer to create my own spice blends from fresh whole spices. I often mail-order spices from Spice House or Penzeys, or buy at a local Indian market. Many pumpkin pie spice blends contain cinnamon, ground ginger, and nutmeg, and some also include allspice, cloves, or mace. Warm and sweet spices seem to be the basis, and cinnamon is typically the most prominent in the mixture. Sometimes I add other spices like cardamom, star anise, candied ginger, or vanilla for complexity. Will Meyers likes to keep spices simple, preferring cinnamon and allspice in his flagship pumpkin beer. Dick Cantwell is not afraid to use herbs, fruits, nuts, or other ingredients in the mix, thinking of flavor combinations like a chef.

Many base beer styles work well with pumpkin ales. Malty amber ales are the traditional base, but over time the base beers used in commercial beers seem to be growing in alcohol strength. Maybe stronger beers are used so people can make a "great pumpkin" joke, but I find booziness doesn't really help the pumpkin. Imperial stouts and barleywines are increasingly common, but I think amber-to-brown malty styles are the natural choice. I would consider English brown ale and porter, Scotch ale, Baltic porter, dunkel, doppelbock, bière de garde, Belgian dubbel, or altbier to be decent choices as a base style, or any amber lager. If going with a lighter-colored beer, I think saison, witbier, or Belgian blonde would be a fun experiment.

Some believe that hoppier IPAs and roastier stouts tend to cover up the pumpkin character, but these examples are common today. I also see many people making pumpkin beers with coffee, chocolate, something sour, smoked, Bourbon barrel, kveik yeast, and other strongly-flavored additives or enhancements. I'm always open to trying new flavor combinations, but for me, I like to let the pumpkin take center stage. It's a difficult ingredient to work with, so when I use it I like it to be the feature component.

Yeast selection is another recipe decision. I prefer malty or fruity strains, and avoid phenolic strains. Will Meyers agreed, saying that one notable failure was due to using a very phenolic Belgian yeast where a sweeter, fruitier abbey-type strain would have been a better choice. Will recommends English strains for general use, but also likes Bavarian weizen and the W34/70 lager strain for specialty use in specific styles.

BREWING DECISIONS AND IMPLICATIONS

There is no consensus of thought on using pumpkin when brewing. It can be used at various points in the brewing process, in several forms, and in varying quantities. I think many of the decisions are controlled by the availability of ingredients, the specific setup of your brewing equipment, and your personal preference for pumpkin flavor.

Pumpkin can be used in the mash, in the boil, and in the fermenter. Will uses shredded raw pumpkin only in the mash at a rate between a half pound and a pound per gallon of beer (60–120 g/L) depending on the intensity of the base beer style, and tends to mash at about 154 °F (68 °C). Dick Cantwell in his book *Eclectic IPA* uses about a half pound (0.23 kg) of pumpkin puree in each of the mash, kettle, and fermenter for a 5-gallon (19-L) batch. I tend to use pumpkin puree only in the boil, and I use a lot

ENTERING PUMPKIN BEERS IN COMPETITIONS

You've created a great beer, but now you are confused about how to enter it in a Beer Judge Certification Program (BJCP) competition. Where you enter the beer is a function of those recipe decisions you made early on. Pumpkins and gourds are specialty ingredients, so you should look at styles in the Specialty-Type Beer section of the guidelines.

Traditional pumpkin ales should be entered as Style 30B Autumn Seasonal Beer. This beer style was created for these types of beers, and allows for spicing, the use of pumpkins or other squashes, and the use of sweeteners and other adjuncts. While in the Spiced Beer category, it does allow for the distinctive ingredients common in these types of beers. Just be sure to describe your beer and the special ingredients you used.

Those creating unspiced pumpkin beers based on a classic style should enter the beer as Style 30A Spice, Herb, or Vegetable Beer. Yes, this style allows for spiced versions, but is also the place where those beers with only a vegetable addition would be entered. Be sure to mention if you used a distinctive heirloom gourd variety, as well as the base style of beer.

If you are producing a beer using gourds based on a specialty-type base style, enter it as Style 34B Mixed-Style Beer. As always, a good description is a must. State the base style, special ingredients or processes, and type of gourds used. Those producing smoked or barrel-aged beers with pumpkin may find this style gives better results.

One final recommendation: If you can't taste or otherwise perceive a special ingredient, don't mention it. If that special ingredient is the basis for entering a specific style category, you probably won't score well. If you mention an ingredient, judges will expect to perceive it somehow. It doesn't have to dominate your beer, but it should be noticeable. The combination of your beer and the special ingredient should be well-balanced, and pleasantly drinkable. It's often a challenge to use a special ingredient without making it seem artificially prominent.

SQUASH TRIPEL

(5 gallons/19 L, all-grain)
OG = 1.072 FG = 1.005
IBU = 23 SRM = 4 ABV = 8.8%

An unspiced squash tripel recipe courtesy of Will Meyers, Brewmaster at Cambridge Brewing Company in Cambridge, Massachusetts.

INGREDIENTS

12 lbs. (5.4 kg) Pilsner malt
4 oz. (113 g) Vienna malt
4 oz. (113 g) aromatic malt
3.75 lbs. (1.7 kg) heirloom squash (butternut or kabocha, preferred)
1.25 lbs. (0.57 kg) clear candi sugar (15 min.)
8 AAU Saaz hops (60 min.) (2 oz./57 g at 4% alpha acids)
Wyeast 3787 (Trappist High Gravity), White Labs WLP530 (Abbey Ale), Imperial Yeast B48 (Triple Double), or Mangrove Jack's M41 (Belgian Ale) yeast
1 cup corn sugar (if priming)

STEP BY STEP

Prepare the squash by washing and splitting them, removing the seeds and other guts, and cutting into chunks. Shred into a fine julienne with a food processor shredding plate, but go slowly.

This recipe uses reverse osmosis (RO) water. Adjust all brewing water to a pH of 5.5 using phosphoric acid. Add 0.5 tsp of calcium chloride and 0.5 tsp of calcium sulfate to the mash.

Mash in the malts and shredded squash at 147 °F (64 °C) for 60 minutes. Raise the temperature to 168 °F (76 °C) to mashout. Recirculate for 15 minutes. Sparge slowly and collect 6.5 gallons (24.5 L) of wort.

Boil the wort for 90 minutes, adding hops at the times indicated in the recipe. The sugar is added with 15 minutes left in the boil.

Chill the wort to 62 °F (17 °C), pitch the yeast, and ferment until complete. Keep the temperature cool (64 °F/18 °C) for the first two or three days, then allow it to warm to no more than 72 °F (22 °C). Give it at least 10 days in primary, then at least three weeks in secondary. If you want to try something different, soak an ounce (~30 g) of medium-toast French oak chips in a dry, aromatic white wine like Sauvignon Blanc for a day, then put the chips in the secondary.

Rack, prime and bottle condition, or keg and force carbonate to 4 volumes.

SQUASH TRIPEL

(5 gallons/19 L, extract only)
OG = 1.072 FG = 1.005
IBU = 23 SRM = 4 ABV = 8.8%

INGREDIENTS

8.9 lbs. (4 kg) extra light or Pilsner liquid malt extract
3.75 lbs. (1.7 kg) heirloom squash (butternut or kabocha, preferred)
1.25 lbs. (0.57 kg) clear candi sugar
8 AAU Saaz hops (60 min.) (2 oz./57 g at 4% alpha acids)
Wyeast 3787 (Trappist High Gravity), White Labs WLP530 (Abbey Ale), Imperial Yeast B48 (Triple Double), or Mangrove Jack's M41 (Belgian Ale) yeast
1 cup corn sugar (if priming)

STEP BY STEP

Prepare the squash by washing and splitting them, removing the seeds and other guts, and cutting into chunks. Shred into a fine julienne with a food processor shredding plate, but go slowly.

Use 6 gallons (23 L) of water in the brew kettle; heat to 158 °F (70 °C).

Place the shredded squash in a mesh bag and steep in the hot water for 3 hours. Remove the mesh bag, then turn the heat off.

Add the liquid malt extract and stir thoroughly to dissolve the extract completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil. Boil the wort for 60 minutes, adding the hops at the times indicated in the recipe. Add the sugar with 15 minutes left in the boil.

Chill the wort to 62 °F (17 °C), pitch the yeast, and ferment until complete. Keep the temperature cool (64 °F/18 °C) for the first two or three days, then allow it to warm to no more than 72 °F (22 °C). Give it at least 10 days in primary, then at least three weeks in secondary.

Rack, prime and bottle condition, or keg and force carbonate to 4 volumes.

Photo by Shutterstock.com

TRADITIONAL PUMPKIN ALE

(5 gallons/19 L, all-grain)
OG = 1.054 FG = 1.014
IBU = 15 SRM = 14 ABV = 5.4%

This is my traditional amber spiced pumpkin ale recipe, a classic example of what would come to mind if you ordered a pumpkin beer a decade ago.

INGREDIENTS

4 lbs. (1.8 kg) pale ale malt
2 lbs. (0.9 kg) Vienna malt
1.5 lbs. (0.68 kg) dark Munich malt
12 oz. (340 g) flaked oats
12 oz. (340 g) flaked wheat
12 oz. (340 g) caramel malt (20 °L)
6 oz. (170 g) brown malt
2 oz. (57 g) chocolate malt
8 oz. (227 g) brown sugar
3 oz. (85 g) light molasses
9 lbs. (4.1 kg) canned pumpkin puree (plain, unspiced)
6 cinnamon sticks, broken up
1.5 Tbsp. crystalized ginger, chopped
1 whole nutmeg, chopped
10 dried allspice berries, crushed
0.25 tsp. ground mace
4.1 AAU UK Goldings hops (60 min.) (0.7 oz./20 g at 5.9% alpha acids)
Wyeast 1272 (American Ale II), White Labs WLP051 (California Ale V), or Mangrove Jack's M36 (Liberty Bell Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Prepare the pumpkin (can be done the night before brewing) by removing from cans and putting into a large baking dish. Roast in a 400 °F (204 °C) oven for about one hour, stirring every 15 minutes, until fairly dry and caramelized but not burned. Put in a fine mesh bag. If prepared the night before, allow to cool, cover, and refrigerate until brew day. Remove from refrigerator and allow to come to room temperature before using.

Prepare spices (can be done during the mash or boil). Place spices in a fine mesh bag (a hop bag works nicely).

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.

Step mash: Mash in first five grains at 131 °F (55 °C) using a 1.5 qts./lb. water-to-grist ratio (3.1 L/kg). Hold for 15 minutes. Raise to 149 °F (65 °C) and rest for 30 minutes. Raise to 158 °F (70 °C) and rest for 30 minutes. Finally, raise to 168 °F (76 °C) to mashout. Add the pumpkin in the mesh bag, and the caramel, brown, and chocolate malts, and recirculate for 15 minutes, recirculating over the top and through the mesh bag.

Sparge slowly and collect 6.5 gallons (24.5 L) of wort. If lautering is difficult, adding a pound (0.45 kg) of rice hulls can help.

After the wort has been collected, add the mesh bag of pumpkin to the kettle. Leave it in the kettle as it comes to a boil. Remove the bag when the wort has come to a boil, allowing liquid to drip back into the kettle.

Boil the wort for 90 minutes, adding hops at the time indicated in the recipe. The sugar and molasses are added with 15 minutes left in the boil. Put the spices in a tight mesh bag and add when boil is complete, stirring; remove after 10 minutes. Run off from the kettle slowly, preferably filtering through the spent hops.

Chill the wort to 66 °F (19 °C), pitch the yeast, and ferment until complete.

Rack the beer, allowing the beer to drop bright, using crash cooling or fining if necessary. Adjust spices to taste, if desired. Prime and bottle condition, or keg and force carbonate.

TRADITIONAL PUMPKIN ALE

(5 gallons/19 L, extract with grains)
OG = 1.054 FG = 1.014
IBU = 15 SRM = 14 ABV = 5.4%

INGREDIENTS

6 lbs. (2.7 kg) amber liquid malt extract
12 oz. (340 g) caramel malt (20 °L)
6 oz. (170 g) brown malt
2 oz. (57 g) chocolate malt
8 oz. (227 g) brown sugar
3 oz. (85 g) light molasses
9 lbs. (4.1 kg) canned pumpkin puree (plain, unspiced)
6 cinnamon sticks, broken up
1.5 Tbsp. crystalized ginger, chopped
1 whole nutmeg, chopped
10 dried allspice berries, crushed
0.25 tsp. ground mace
4.1 AAU UK Goldings hops (60 min.) (0.7 oz./20 g at 5.9% alpha acids)
Wyeast 1272 (American Ale II), White Labs WLP051 (California Ale V), or Mangrove Jack's M36 (Liberty Bell Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Prepare the pumpkin (can be done the night before brewing) by removing from cans and putting into a large baking dish. Roast in a 400 °F (204 °C) oven for about one hour, stirring every 15 minutes, until fairly dry and caramelized but not burned. Put in a fine mesh bag. If prepared the night before, allow to cool, cover, and refrigerate until brew day. Remove from refrigerator and allow to come to room temperature before using.

Prepare spices and place them in a fine mesh bag.

Use 6 gallons (23 L) of water in the brew kettle; heat to 158 °F (70 °C). Place the pumpkin (still in the mesh bag), and the caramel, brown, and chocolate malts in another mesh bag, and steep in the hot water for 30 minutes. Remove the mesh bags, then turn the heat off.

Add the liquid malt extract and stir thoroughly to dissolve the extract completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Put the pumpkin mesh bag back in, turn the heat back on and bring to a boil. Once a boil is reached, remove the pumpkin, allowing liquid to drip back into the kettle. Boil the wort for 60 minutes, adding the hops at the time indicated in the recipe. Add the sugar and molasses with 15 minutes left in the boil.

Follow the remainder of the all-grain recipe.

— about nine pounds for a 5-gallon batch (4 kg/19 L).

Using shredded raw pumpkin in the mash has the advantage of simplicity during brewing, albeit at the cost of extra prep work before brewing even starts. This approach probably gets the purest pumpkin flavor. Don't worry about the rawness of the vegetable since mashing and lautering does cook it. Just don't expect fermentables from the process. I usually don't include pumpkin in any gravity calculations. When using raw pumpkin, I was concerned about it getting misinterpreted as acetaldehyde, which sometimes has a fresh-cut pumpkin flavor. However, since the pumpkin gets heat, this character is not noted in the finished beer.

Will cautions about the flavor of cooked pureed squash getting lost in the mash, which is a problem I noted. That's why I moved the pumpkin to the boil. But it gets messy that way, both in the kettle and subsequently in the fermenter. I tend to put the puree in a mesh bag during the boil, but that only partially removes it. Filtering through hops helps, but not entirely. The fermenter will still look like it's full of cold break. Orange cold break. I mitigate this problem by using a fermenter where I can drain from the bottom, slowly and through a coarse filter, but you should expect some volume loss when using pumpkin. I account for this by brewing a larger recipe so I can have more finished beer.

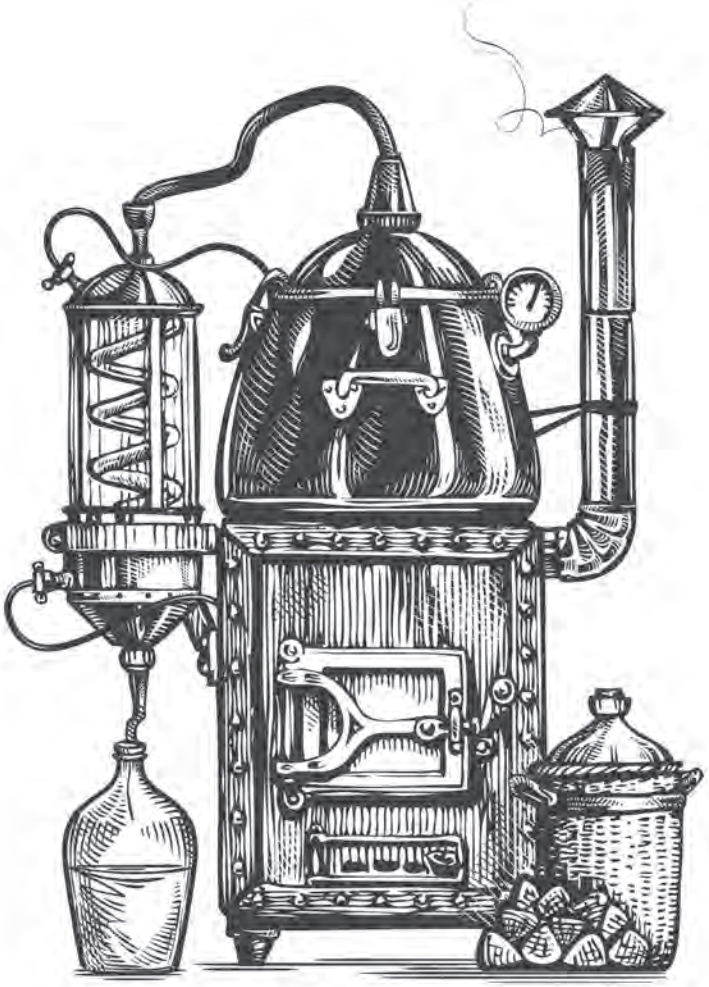
While I'm OK with the flavor of raw squash, I'm not a fan of raw spices. I think spices should see some heat to cook out the rawness, like in cooking. So I don't like to use spices like dry hops, unless I've prepared them in a tea first. I normally add spices like late hops, with a minute or two left in the boil or during the whirlpool. I put them in a fine mesh bag and remove them after five or ten minutes; I don't want to pull drying astringency from them. I typically use spices late in the boil, and make a final adjustment post-fermentation based on tasting. Pick out any spices that need a little enhancement and then make a small tea by steeping the desired spices in boiling water for 5–10 minutes, then blend the cooled tea into the finished beer.

I often avoid the use of clove in spice blends if the beer will be entered into competition because judges may misinterpret this as a brewing fault, even if you declare clove as an ingredient. Allspice is a better alternative.

The use of sugars can add flavor complexity. I prefer caramel flavors from sugars, and use natural brown sugars, golden syrup, molasses, real maple syrup, and similar products. I'm not a fan of overly sweet pies, so I don't tend to load up on the unfermentable sugars. However, I think a little lactose is probably the best way to adjust sweetness without worrying about it fermenting out. But I tend to prefer increasing maltiness and reducing bitterness to this approach, but that's a personal preference. BYO

Looking to try your hand in the broad world of distilling?

Check out the following programs and equipment on the next several pages to start your journey down the path to distilling.



HIGHLIGHTS

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- Equipment Planning for Expansion
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SALES & BUSINESS OPERATIONS

- Intellectual Property Strategies for Breweries
- Post-Pandemic Taproom Trends
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- Membership Programs to Boost Loyalty & Revenue
- Relaunching Taproom Events Panel
- Finding & Keeping Staff
- Small Craft Brewery Business Trends Panel

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- Keys to a Better Nano Business Plan
- Breaking Down the Numbers on Taproom-Focused Breweries
- Brewery Branding 101
- Top 5 Legal Mistakes To Avoid As A New Brewery
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SCHEDULE AT-A-GLANCE

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BYO NANO CON ONLINE

NanoCon Online Day #1 • Friday, December 3, 2021

11:00 AM – 12:00 PM	Post-Pandemic Taproom Trends	Optimizing Brewery Layout for Workflow & Space	Top 5 Legal Mistakes to Avoid as a New Brewery
12:00 – 12:30 PM	Q&A WITH NANO VENDORS		
12:30 – 1:30 PM	Hazy Brewing Case Studies	Planning a Brewery Quality Control Program	Brewery Metrics & Key Performance Indicators
1:30 – 2:15 PM	NANO CRAFT BREWING TRENDS PANEL		
2:15 – 3:15 PM	Breaking Down the Numbers on Taproom-Focused Breweries	Finding & Keeping Staff	Evaluating your Malt
3:15 – 3:45 PM	Q&A WITH NANO VENDORS		
3:45 – 4:45 PM	Relaunching Taproom Events Panel	Taproom Draught System Troubleshooting & Maintenance	Nano Tank: Pitches to Expert Panel
4:45 – 5:15 PM	Q&A WITH NANO VENDORS		

NanoCon Online Day #2 • Saturday, December 4, 2021

11:00 AM – 12:00 PM	Enzymes, Nutrition & Brewing Process Aids	5 Steps to Taproom Success from Day One	Financing a Brewery Expansion
12:00 – 12:30 PM	Q&A WITH NANO VENDORS		
12:30 – 1:30 PM	Keys to a Better Nano Business Plan	Turning Social Posts into Sales	Hard Seltzer Production for Nanos
1:30 – 2:15 PM	NANO BUSINESS TRENDS PANEL		
2:15 – 3:15 PM	Intellectual Property Strategies for Breweries	Starting Up a Sensory Panel	Brewery Branding 101
3:15 – 3:45 PM	Q&A WITH NANO VENDORS		
3:45 – 4:45 PM	Equipment Planning for Expansion	Planning your Taproom Draught System	Membership Programs to Boost Loyalty & Revenue
4:45 – 5:15 PM	Q&A WITH NANO VENDORS		

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BY DREW BEECHUM & DENNY CONN

OPEN FERMENTATIONS

Circling back to fermenters of yesteryear

Brewers worry during fermentation. It's that period when we as brewers must walk away and wonder what alchemical transfiguration our precious wort is experiencing. Will it be delicious gold or ponderous dull lead? Without much to do, brewers endlessly fret — how do I improve my fermentation environment? How do I prevent my beer from going deliriously squirrelly? Is it infected?

From a modern perspective, one of the biggest things we do to prevent contamination is to lock our wort away from anything potentially non-sanitary. With the rise of monoculture brewing, the advent of the closed conical vessel meant brewers could reliably keep the yeast they intended working alone, but it comes at a cost.

To give some perspective on this, think about your own brewing or your favorite brewery. As you grow and change equipment — say a new fancy brew rig — we know that recipes take some adaptation. Drew will never forget the changes to the beers that occurred when Stone Brewing Co. moved from their medium-sized (2nd?) brewhouse to the grand campus they occupy today. The brewhouse changed drastically to a complex and radically different setup. It took about six months of brewing to dial in the recipes and make Stone IPA taste like Stone IPA again.

And that's with today's understanding of what makes brewing work. Back in the pre-WWI period when Leopold Nathan developed the forerunner to the modern cylindroconical vessel (CCV), brewing was primarily dominated by tradition and handed down lore/knowledge. The radical change proposed by this crazy Swiss was dangerous.

The important thing to realize is that from say ~10,000 BCE–1920 CE, fermentation, especially ale ferments were mainly done in vats open to the universe (barring a roof or two). That also means our friendly neighborhood yeast cells were primarily adapted to low-pressure environments. Lager brewers around the world were used to closed fermentation environments (with exceptions like Pilsner Urquell), after all, keeping long stored "clean" beer safe from contamination proved to be easier in a closed environment.

Convincing ale producers with their long lineage back through time to convert, was a bit more arduous. Ale cultures would have been selected on how reliably they turned small beers around with good character as well as made fantastic keeping beers with their mixed cultures of *Brettanomyces*.

It's on that first part — the fast turn around of small beers for fresh consumption — that was paramount for brewers. Then, as today, brewers didn't want an excessive outlay for beers that sat in tanks for extended periods (porter aside). Beer that was knocked out quickly meant extra profits.

Having found yeast cultures that gave them both the speed they desired and the taste the customers loved, brewers were naturally hesitant to adapt the lager-centric idea of closing everything to the sky. Guinness and other ale brewers ran many trials to understand the impact of a closed conical on their beers. Soon, after tweaks, many breweries began jumping on board. From a monetary sense it seems natural to pursue less spoiled beer.

But there was a cost — yeast performance changes when you change the environment. Yeast under pressure and in closed environments will express less character; less fruit, less this or that. If the yeast makes beer in a quick enough time without additional brewer intervention, then off we go, but if it requires

To make a beer via open fermentation, you need to have full faith and trust in your cleaning and sanitation regimen.

Photo by Denny Conn

Sierra Nevada Brewing Co.'s open fermentation vessels for their hefeweizen churning away.

help, then it needs replacing with a more performant strain at the expense of its unique profile.

Open fermentation hasn't completely died away. If you tour through Belgium today you'll still see some open fermentation happening, like the loose-lidded tanks at Fantome Brewing (incidentally, the same tanks are at St. Somewhere Brewing in Tarpon Springs, Florida) or the open squares at Dupont (or the De Halve Maan museum tanks of enameled cast iron).

Even here in the states where CCVs are by far and away the norm, we still have some practitioners of the open fermentation voodoo that aren't Belgian. Anchor Brewing, San Francisco's real treat, has used open shallow pans for its Steam beer and deeper squares for its ales like their Porter, Liberty, etc.

SIERRA STORIES

About 20 years ago, Denny tried to open ferment a couple batches. Of course, he had no idea what he was doing or how to do it and the resulting beer proved that all too well! He simply left the lid off the fermenter from the time the yeast went in until he was ready to bottle. (Yeah, not too bright in my opinion.) That may have been his first (but not last) batch to get dumped.

In 2011, Denny had the opportunity to spend three days at Sierra Nevada Brewing Co. in Chico, California as part of their Beer Camp program. Besides getting to brew an altbier on their pilot system, he got to see how they do what they do. He saw some of the biggest CCV fermenters he'd ever seen. But he also got to see something that he had no idea he'd see … their open fermentation vats.

Sierra Nevada ferments both their hefeweizen and Bigfoot barleywine in open fermenters. But they don't just leave them open. They use a positive pressure room with HEPA filters. That means that the pressure in the room is always higher than the pressure outside, which discourages infiltration by all the stuff you don't want in your beer. The idea is that open fermentation relieves the pressure on the yeast and allows it to express itself and perform better than it would in a sealed fermenter. I think their results speak for themselves!

But here's the good news — you don't need fancy positive pressure environments to make open fermentation work for you — all you need is some foil and a willingness to pay attention to your ferment. (Although let's be frank, who wouldn't want some of the fancy gear?)

To make a beer via open fermentation, you need to have full faith and trust in your cleaning and sanitation regimen. If there's any doubt, you're adding risk to your brew day. Where older brewers had to use leather hoses and other questionable implements, we benefit from a cleaner starting point. Keep the cold side scrupulously sanitary!

Have your yeast raring to go. We both use the "Shaken Not Stirred" starter method to generate plenty of vital yeast. (See the July-August 2019 issue or online at https://byo.com/

DREW'S OPEN FERMENTATION EXPERIMENTAL MILD

(6 gallons/23 L, all-grain)
OG = 1.038 FG = 1.008
IBU = 21 SRM = 8 ABV = 3.3%

INGREDIENTS

6 lbs. (2.7 kg) Maris Otter pale ale malt
2.25 lbs. (1 kg) Pilsner malt
1.5 oz. (43 g) black patent malt
0.75 lb. (0.34 kg) invert syrup #1 (~15 °L) (60 min.)
6.3 AAU Magnum hops (60 min.) (0.5 oz./14 g at 12.6% alpha acids)
Wyeast 1275 (Thames Valley), White Labs WLP023 (Burton Ale), or Lallemand Windsor yeast
½ cup corn sugar (if priming)

STEP BY STEP

Mash in at roughly 1.5 qts./lb. (3.1 L/kg) targeting a mash temperature of 152 °F (67 °C). Hold at this temperature for 60 minutes. Begin recirculation and sparge with no more than 3 gallons (11 L). Top up with water to begin the boil at about 7 gallons (26.5 L). Boil for a total of 60 minutes adding the hops and invert sugar at the beginning of the boil.

After the boil is finished cool the wort to 66 °F (19 °C), transfer to a fermenter large enough to allow the kräusen room to expand, then pitch your yeast starter (if using a liquid strain). Do not seal your fermenter with an airlock or other device, simply place a loose lid as a covering. When fermentation slows, transfer to a closed vessel or replace the loose lid with an airlock or other device to enclose the fermenter.

After fermentation is complete, allow the beer a few days to condition, then package the beer using priming sugar if bottling.

DREW'S OPEN FERMENTATION EXPERIMENTAL MILD

(6 gallons/23 L, extract with grains)
OG = 1.038 FG = 1.008
IBU = 21 SRM = 8 ABV = 3.3%

INGREDIENTS

6.6 lbs. (2.7 kg) Maris Otter liquid malt extract
1.5 oz. (43 g) black patent malt
0.75 lb. (0.34 kg) invert syrup #1 (~15 °L) (60 min.)
6.3 AAU Magnum hops (60 min.) (0.5 oz./14 g at 12.6% alpha acids)
Wyeast 1275 (Thames Valley), White Labs WLP023 (Burton Ale), or Lallemand Windsor yeast
½ cup corn sugar (if priming)

STEP BY STEP

Start with 3 gallons (11 L) water in your brew pot. Place crushed malt in a mesh bag and steep as the water heats up to 168 °F (76 °C). Remove grain bag and off heat, add the liquid malt extract. Stir until all has dissolved, then resume heating. Once the wort begins boiling, add the hops and invert sugar. Boil for 60 minutes.

After the boil is finished cool the wort to 66 °F (19 °C), transfer to a fermenter and follow the remaining fermentation and packaging instructions from the all-grain recipe.

article/yeast-mechanics/) And though neither of us puts much stock in minimizing lag time, for open fermentations the faster you're going the better!

Chill your wort and transfer into your vessel of choice – pitch your yeast and cover where you'd normally put an airlock with sanitized foil. Walk away and wait patiently for the yeast to do their thing.

Where Anchor and Sierra Nevada Brewing Companies can build safe rooms for their beers, we use foil and it works. Why? To put it simply — bacteria can't walk and they can't fly, except on bits of dust and dirt. During an active, open fermentation in a covered vessel the outbound rush of carbon dioxide helps push motes away from the vessel while the foil prevents any stray stuff falling into the fermenting wort.

You must keep an eye on your beer! Be prepared to transfer/seal it as primary fermentation begins to slow. This is no time for forgetting the spare carboy in the back of the closet!

The easiest way to tell is to watch your kräusen. When it begins to collapse, seal the vessel. Take gravity readings and when you approach a few points away from your supposed (or learned) terminal gravity, bung it up! From that moment on — treat it like any other beer you make.

By the way, it doesn't have to be foil, that's just cheap and easy (Denny's favorite). You can open ferment in a pot, with just the lid top. Want to replicate the shallower squares of a traditional ale fermentation? Use a deep hotel pan. (A full-size, 8-in./20-cm deep pan has capacity for a 5-gallon/19-L batch.)

The how is easy enough, the why is another matter. Yeast expression and performance vary from strain to strain. Split a ferment with a strain like Wyeast's 1275 (Thames Valley) or White Labs WLP023 (Burton Ale). The closed fermentation beer will be noticeably sharper with less fruit, where the open ferment will be softer and more estery.

Drew has written extensively on his preference for fermenting saisons openly — largely driven by performance factors. No saison stall!

But for years, Drew has open fermented in a set of 10-gallon (38-L) kegs just by popping the pressure relief valve and covering the lid with foil. There were very few beers that didn't respond in interesting ways to the treatment. About the only things he's skipped open fermentation for are IPAs and German styles. Everything else has been through the freedom of no airlock brewing.

Now, you might be wondering — really an airlock or a blow off tube makes that much difference? Yes, the incremental pressure impact of an airlock is negligible, but an airlock prevents gas mixing - e.g. a low level of oxygen to remain in the head space and a small amount of ingress via the "open" top. Such a small change can have massive impacts on yeast performance. (See the currently proposed suppression of STA-1 expression in low oxygen environments and possible impact on saison/Belgian yeast performance.)

If you try it nowhere else, give an English style a try! Drew's Mild sings best when allowed to breathe! BYO

BY FEDERICO TONDINI

ALTERNATIVE SOURING METHOD

Acid-producing yeast strains

In recent years, sour beers have risen in popularity thanks to the niche of consumers who find the array of fruited or barrel-aged or mixed fermentation tart beverages an exciting new world to explore. In Europe, sour beers are traditionally made with an obscure brewing process that has been utilized for centuries. They have the right complexity to take off in a market obsessed with the in-depth search for layers of complexity. Sour beers begin with the same mashing technique as all beers, but then a variety of microorganisms impart the tart taste to the drink and also produce different combinations of flavors each time, ranging from fruity to funky. Brews that would have been thrown away in the recent past, are now requiring more and more tank space in the breweries, and old traditional recipes have been twisted by experienced brewers to keep up with the growing demand.

Among yeast genera, *L. thermotolerans* displays a unique ability to produce lactic acid concomitant to alcoholic fermentation . . .

Photo by Wes Hagen

Grape skins contain an amazing diversity of microorganisms that scientists and yeast ranchers are exploring for various purposes.

THE NEWEST INNOVATION IN THE PRODUCTION OF SOUR BEERS

The category of sour includes different types of beers with a common sour taste and low pH due to organic acid concentration (mainly lactic and acetic). These beers are generally fermented using both bacteria and yeasts. Traditionally souring is achieved by fermentation followed by a long-term aging process brought forth by a consortium of indigenous or inoculated microbes. This approach has several limitations, primarily poor process control, lack of consistency in product quality, long processing time, and risk of cross-contamination. Kettle souring has therefore become a common alternative to traditional souring. It involves inoculation and acidification by specific lactic acid bacteria (LAB) in the brewing kettle, followed by a second boiling executed with the purpose of eliminating the bacteria. Only then, wort is transferred and fermented with yeast. While this newer method enables quick souring, the resulting beers generally lack depth and complexity due to this extra boiling, which causes the loss of aroma compounds and is responsible for the absence of the specific characteristics that originate from the metabolic activities that occur during the souring process. Moreover, this technique, when applied on a commercial-scale, can block further brewing in so far as the kettle cannot be used for production of new wort.

The use of yeast that both acidifies and ferments (referred to as "primary souring" because it is executed by the same organism during primary fermentation) represents an interesting alternative that needs an in-depth investigation. The process can be simplified and shortened without the addition of bacteria, thereby reducing the risk of cross-contamination. In addition, aroma compounds are retained in this souring method.

Many potential non-*Saccharomyces* yeast species have been evaluated, but a yeast utilized in the wine world called *Lachancea thermotolerans,* whose hallmark is its acidification properties, positioned it as the most viable alternative to lactic acid bacteria for the production of sour beers. Beer fermentation by *L. thermotolerans* has proven to be achievable without detrimental effects on the sensory and physical properties of beer. However, according to recent studies, there is a significant variation between various strains of *L. thermotolerans* in fermentation performance, lactic acid production, and in the overall aroma profile. More experiments are needed to determine

the influence of this non-*Saccharomyces* yeast on the overall aroma profile of beer.

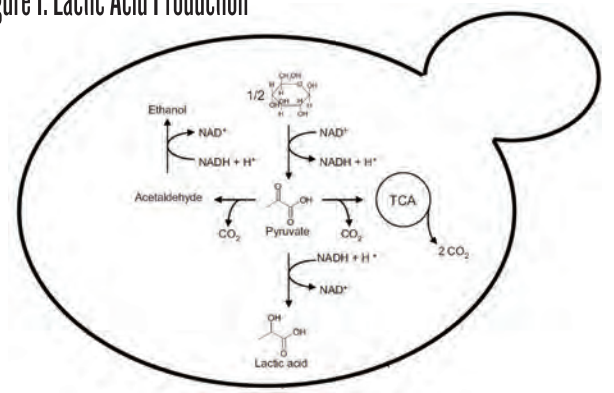
Instead of exploring biodiversity, a different approach to creating alternative souring organisms using genetic modification resulted in a *S. cerevisiae* strains capable of producing lactic acid during fermentation. Sourvisiae from Lallemand and Galactic from Berkeley Yeast are two such strains. Sourvisiae is reported to produce very acidic beer (final pHs in the range of 3.0) and to finish fermentation in approximately five days; however, it imparts only a slightly fruity flavor, lacking the sought after aromatic expression. The yeast also "commits suicide" by producing too much lactic acid, therefore it cannot be reused. Final pH and ability to repitch can be mitigated by co-inoculating Sourvisiae with a regular *S. cerevisiae* brewing strain. Galactic yeast finishes in the 3.5–3.8 range and is reported to be re-pitchable.

A QUICK BACKGROUND ON *LACHANCEA THERMOTOLERANS*

The biotechnological potential of yeasts other than *Saccharomyces,* commonly referred to as "non-conventional" or *"*non-*Saccharomyces"* brewer's yeasts, has triggered the scientific interest to untap one remarkable species: *Lachancea thermotolerans.* This yeast is commonly found on grapes and in wines worldwide and its oenological performance has been widely studied. Among yeast genera, *L. thermotolerans* displays a unique ability to produce lactic acid concomitant to alcoholic fermentation, and for winemakers it has proven capable of imparting positive effects on wine chemical and sensory profiles when co-inoculated with *S. cerevisiae.* The key enzyme implicated in lactate biosynthesis is lactate dehydrogenase (LDH; E.C. 1.1.1.27). In *S. cerevisiae,* the major metabolic flux converts pyruvate from glycolysis to ethanol: The fermentation to lactate may also provide an alternative pathway that, similarly to alcoholic fermentation, fulfills the cellular redox balance (Figure 1). The molecular mechanisms underlying this lactate production in *L. thermotolerans* at the expense of ethanol or other metabolites are still poorly understood. Depending on the inoculated strain and the fermentation conditions, different strains of *L. thermotolerans* may in fact produce different concentrations of lactic acid during wine fermentation (1.0 and 16.8 g/L in *L. thermotolerans* monocultures; in mixed fermentations with *S. cerevisiae* 0.18 to 6.38 g/L).

This peculiar feature of *L. thermotolerans* has led to the commercialization and the adoption of various active dry yeast (ADY) strains in the wine industry: Laktia (Lallemand), Concerto (Chr. Hansen), Octavia (Chr. Hansen), Levulia Alcomeno (AEB), Zymaflore Omega (Laffort) and Excellence X-FRESH (Lamothe-Abiet). However, the process of biological acidification can be used in wine must (unfermented grape juice) and also in brewer's wort for obtaining a rapid drop in pH. As a result, last year a novel *Lachancea* spp. strain was found in nature by the University of the Sciences in Philadelphia and been brought into production with the sole purpose of sour beer production (WildBrew Philly Sour by Lallemand). The yeast is reported to produce moderate amounts of lactic acid, typically resulting in a final pH range

Figure I: Lactic Acid Production



Lactic acid production by L. thermotolerans. *Lactic acid dehydrogenase (LDH) converts pyruvate to lactic acid (with NAD+ regeneration).*

of 3.2–3.5 and to complete fermentation in 10 days, if proper inoculation and certain fermentation parameters are met. The bouquet includes red apple, stone fruit, and peach.

THE SEARCH FOR A NOVEL *L. THERMOTOLERANS*

Four years ago, from a 5-gallon (19-L) batch of homebrew with friends and former colleagues at the University of Adelaide, I began my deep dive into the brewing characteristics of *L. thermotolerans.* To develop a reliable production method for commercial use that would represent an alternative to bacteria, an initial screening of more than twenty multiple strains (commercially available and from yeast banks) was performed. Upon characterization, only a few *L. thermotolerans* showed potential for beer fermentation, exhibiting good fermentation performance, sugar and nitrogen compound utilization, resistance towards higher ethanol levels and hop antimicrobial iso-α-acids, altogether with considerable lactic acid production. A diverse output from *L. thermotolerans* strains in malt extract was observed, ranging consistently higher final gravity compared to *S. cerevisiae* (i.e., different ability to consume maltose and to not use maltotriose) and a pH ranging from 3.4 to 4.0. One strain of particular interest was "BBMCZ 7FA20," which I'll reference as FA, an indigenous yeast isolated from grape skins in the Burgundy region of France whose fermentation process resulted in lower final pH compared to *S. cerevisiae (*SC), but not excessively tart, as pH 3.2 can sometimes be perceived. However, due to the longer transformation of sugars into alcohol, as well as the relatively high quantity of unfermented sugars left in the final product, the yeast resulted as being characterized better in mixed fermentation with SC. FA was sequentially inoculated with SC at different times (after 2 and 7 days) and compared to SC monoculture in pilot-scale ale beer fermentations (OG 1.038; initial pH 5.3). The FA sour beers reached pH 3.5 while SC remained at 4.1 (Figure 2). Lactic acid production averaged at 2.5 g/L (Table 1). An expert panel comprised of brewers and certified beer tasters confirmed the absence of faults. The mixed culture fermentation with FA produced a distinct aroma profile compared to the aroma produced with monoculture control. The panel described the SC beers as "not sour," "fruity," "phenolic," and "spicy," while FA beers were picked up as "sour," with "citrusy" and "fruity" aroma.

Figure 2: Fermentation and pH Profile

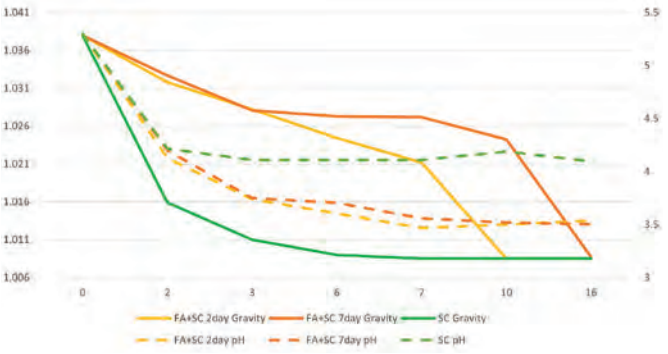


Table I: Analytical Parameters of the Final Beers

Treatment	pH	FG	ethanol (% v/v)	lactate (g/L)
SC	4.1	1.009	4	nd
FA+SC_2d	3.5	1.009	4	2.7
FA+SC_7d	3.5	1.009	4	2.4

GENERAL FERMENTATION CHARACTERISTICS

SUGAR CONSUMPTION AND LACTIC ACID PRODUCTION

FA has interesting fermentation dynamics. Fermentation starts rapidly before the pH drops to 3.5 +/- 0.2 in 48–72 hours (Figure 4). An inoculation rate of 1 x 10^7 cells/mL is recommended to correctly start fermentation (= 100 g/hL or 4.3 oz./BBL, similar to standard ale yeast pitching rates) and maximize lactic acid production. Furthermore, given the fact that dry yeast comes pre-oxygenated there is no need for additional oxygenation at the beginning or throughout the fermentation. An additional dose of small glucose or low mash temperature may also be adopted to improve lactic acid production. Because of the limited sugar consumption, FA inoculation must be followed by another yeast (sequential inoculation). Depending on the specific fermentation condition, two to three days is the best time to inoculate the regular *S. cerevisiae* and finish fermentation. The yeast sequentially inoculated shows a fermentation rate slower than normal due to the lack of glucose in the fermenting wort. FA is compatible with any ale, lager, saison, and *Brettanomyces* yeasts, depending on the desired type of beer.

FLAVOR PROFILE

Fresh and fruity aromatic profiles can be obtained depending on the temperature of fermentation: Grapefruit at a relatively cool temperature (64 °F/18 °C) and tropical expressions at a higher temperature (75–86 °F/24–30 °C). No Band-Aid-like or "rotten eggs" flavors, which are commonly associated with the presence of bacteria or with problematic fermentation, can be perceived.

REPITCHING AND MICROBIAL CONTROL

There is no risk of cross-contamination due to the limited sugar consumption and the fact that this strain is neutralized by cell-to-cell contact by any *S. cerevisiae*. This process not only allows for the maintenance of CIP (clean-in-place) cleaning standard procedures, but also for a higher control of beer acidification. If a higher pH is desired, early inoculation of *S. cerevisiae* results in an early stop of the acidification (allow 12 hours for *S. cerevisiae* to take control of the fermentation). For the same reason, however, no repitching of the cone is possible, insofar as the FA cells are poorly viable at the end of fermentation.

Figure 3: Plato Measurements

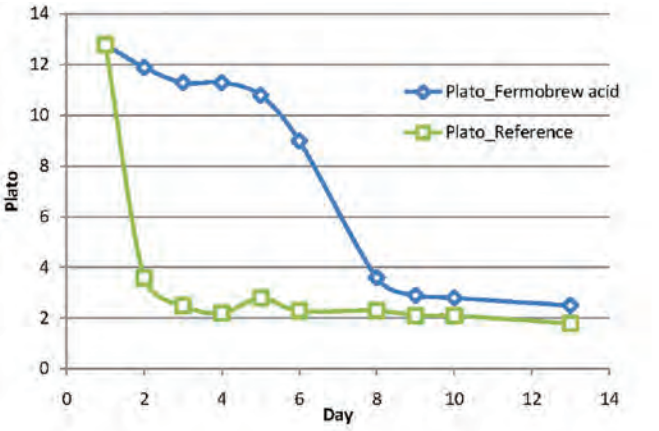
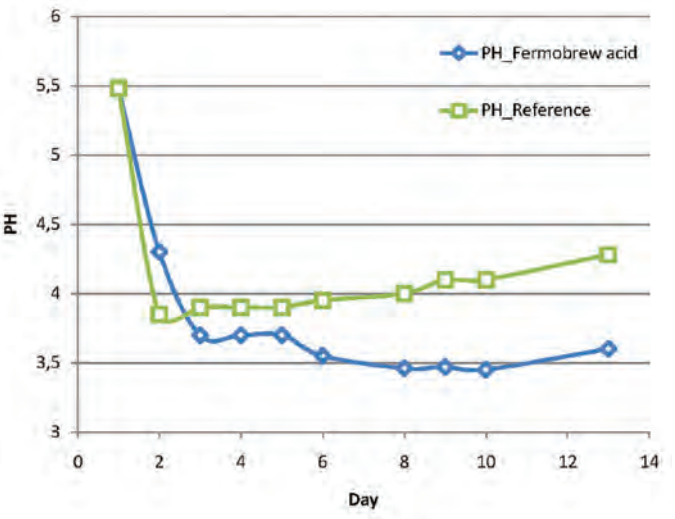


Figure 4: pH Measurements



CONCLUSION

The number of sour beers has increased substantially in recent decades, sparked by the growing interest of consumers for new flavors. The traditional approaches to sour beer production and fermentation result in complex products with numerous positive sensory properties, but such approaches present several logistical (and cash flow) issues for brewers. The desire to overcome these issues has contributed to the development and application of innovative materials and non-*Saccharomyces* yeasts in the process of brewing. The

screening and selection of new species has unveiled the potential of some *L. thermotolerans* strains based on their potential for biological acidification and flavor generation. Along with the WildBrew Philly Sour, "BBMCZ 7FA20" appears adequate to produce appealing sours in sequential inoculation with regular yeast, and it has been commercialized for the production of sour beers (Fermobrew Acid, AEB). It's an exciting new world for brewers to explore.

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BY ANDREAS TAUBMAN

STAINLESS STEEL AUTO-SIPHON

A novel approach to priming a siphon

My path into homebrewing is a familiar tale. I started brewing in a single pot, which slowly over time morphed into a three-pot, fly-sparge system for 10-gallon (38-L) batches. I call a modified stainless conical fermenter my own. The system benefits from a wide range of *Brew Your Own* magazine projects and hacks, like etched volume markings in the kettle, silver soldered tri-clamp flanges inserted with a homemade dimple tool, wig-welded tri-clamp flanges for the conical, and temperature probe made from a Corny keg dip tube. The technique for the temperature probe came in handy for the motorized mash stirrer with PID temperature controller for the induction heater as well. The copper immersion chiller was a very nice build as well.

After all the upgrades of my brew system I found more and more parts had to be carried from the basement upstairs every brew day and more parts had to be cleaned as well. The perfection of the system led unwillingly to a brew day that had to be planned way too long ahead to fit in our family's schedule and therefore had me brewing less often.

When I read the *BYO* article on small-batch brewing in the May-June 2021 issue I realized that brewing smaller brew-in-a-bag (BIAB) batches in-between the big brew days would be the perfect middle ground for my lack of time. The 47-L (12.4 gallon) kettles I own are not practical to use on a kitchen stove, and therefore I purchased a 25-L (6.6-gallon) pot to brew BIAB batches.

I decided I would not want to add any valves to my small pot so I wouldn't have to worry about seats or sealings or drilling holes (which I had been through a lot). Siphoning the wort out of this pot is no problem at all.

The polycarbonate auto-siphon I own made me often wonder if there wouldn't be a stainless version. So after having learned so many metal-working skills due to the previous DIY projects, I decided to build a stainless auto-siphon. I really admire the ingenuity of some of the stainless racking canes/auto-siphons out there for reasonable prices. But here in Germany availability of new products is an issue and when you have an itch for DIY equipment, I think it's rewarding and a lot of fun to innovate.

Since this auto-siphon build is all stainless steel it is therefore resistant to heat, breaking, and certain disinfectants, which polycarbonate is not. And it can completely be taken apart for cleaning. My initial plan for my BIAB system was to have fewer parts to clean. Oh well, at least I'm underway to spend more time brewing.

Since this is all stainless steel it is therefore resistant to heat, breaking, and certain disinfectants, which polycarbonate is not.

Photos by Andreas Taubman

Tools and Materials

- 0.5 m (1.6 ft.) 12-mm (½-in.) OD stainless steel tube (or whatever length seems appropriate for your vessel)
- 1 m (3.2 ft.) 10-mm (⅜-in.) ID silicon hose
- (2) ¼-in. stainless steel outside threaded end caps
- (1) ¼-in. stainless steel coupler, 1 in. (2.5 cm) long
- Button washer head screw M4 x 10 mm
- Silver solder, solder flux, and solder torch
- 1-mm diameter stainless steel welding rod ~5 cm (2 in.) long
- 4-mm (5⁄32-in.) metal drill bit, oil, drill (drill press preferred)
- Die grinder and sand paper

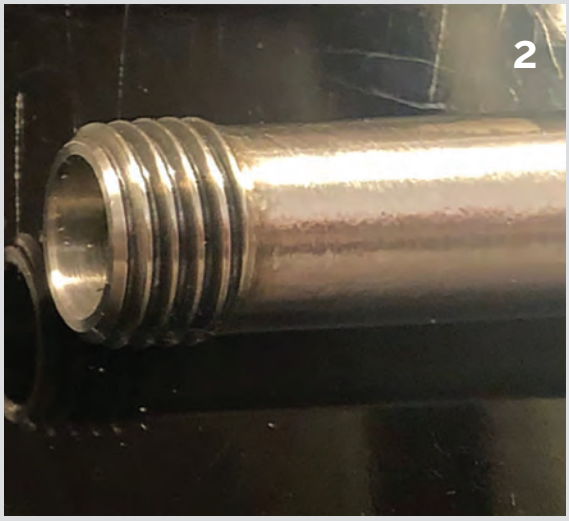
STEP BY STEP

1. BENDING THE KNEE

When looking for a stainless tube, make sure it is heat pre-treated and therefore easy to bend. Also reassure that the tube's inside is seamless and therefore doesn't harbor any sanitary issues. There are several ways to bend a stainless tube without kinks. One way is to insert a metal spiral inside and bend it over a round solid object with the desired radius. Another method is to fill the tube with sand, compacting the sand with a stick and seal the ends of the tube with duct tape. This will provide some support from the inside and minimizes the risk of kinks. I used the compacted sand and combined it with a metal spiral on the outside, which is optional.

2. SOLDERING THE ¼-IN. THREAD

So this step may be omitted if you can get your hands on a tube with the right thread already attached or you come up with another method to attach the cane to the intended valve head. Since ¼-in. thread parts were at hand I didn't bother. I cut the thread off of one of the ¼-in. end caps and soldered it to the straight end of the tube using a crème brûlée burner. Therefore I bent a small piece of silver solder into a ring of the same diameter of the thread and the tube. Apply sufficient flux agent and stack the silver solder and the thread on top of the tube. Use a vice to hold the tube upright. When I did it a second time I realized it is quite tricky to align the thread perfectly to the tube when the solder starts to liquify. So if you stick a piece of bent copper wire inside, the right alignment is mostly preset and there is one less thing to worry about when the metal gets hot.

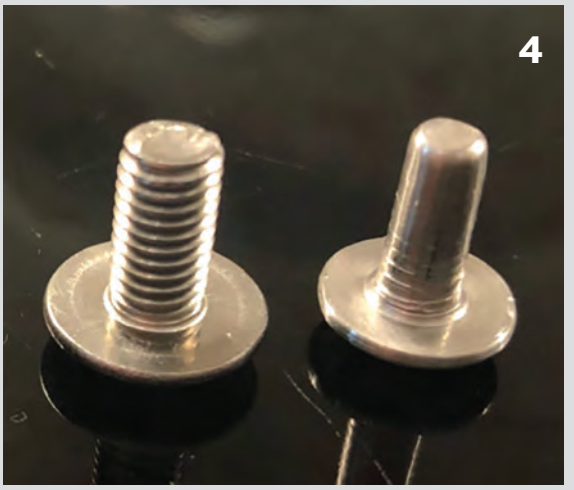


3. DRILLING HOLES IN THE VALVE HEAD

Now the body of the valve head needs to be prepared. The second end cap was screwed in the small ¼-in. coupler. I drilled six 4-mm (5/32-in.) holes so that the open side of the end cap remained intact. This is crucial since you need the rim intact to be able to build a seal with the button washer head screw. The holes were drilled using oil, high pressure, and low rpm with my cordless drill. If you own or have access to a drill press though, I would advise using it. Through these holes the wort will flow inside the cane. Afterwards I used a die grinder and sand paper to smooth out all the sharp edges.

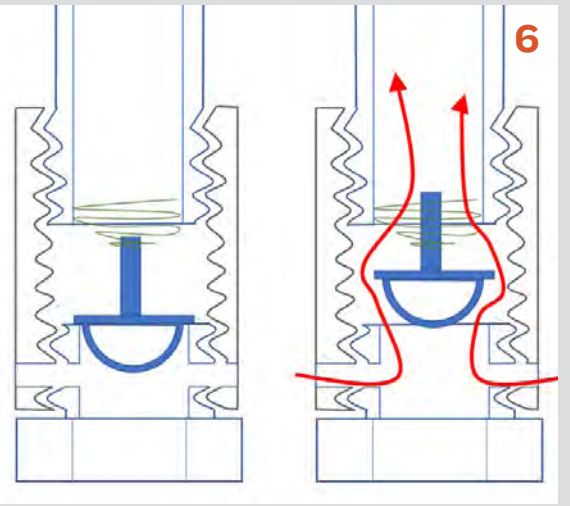
4. PREPARING BUTTON WASHER HEAD SCREW

The button washer head screw was chosen because the convex side fits snuggly in the open end of the remaining ¼-in. end cap. I sanded the head of the screw to still find its way into the end cap but having enough room between the walls of the ¼-in. coupler for the wort to flow. The threads of the button washer head screw were sanded down with a power tool.The before and after pictures are found to the right.



5. BENDING A STAINLESS STEEL SPIRAL

The stainless welding rod was bent into a spring, which fits tight inside the soldered ¼-in. thread and has a narrower winding on the outside so that the smooth ground part of the button washer head screw will slide nicely inside. I used three-jaw pliers for this job but anything you can wrap some wire around will perform fine as well. The free movement of the modified screw inside the valve head is crucial to the functionality of this device.



6. ASSEMBLY AND PERFORMANCE

Once all parts are put together, the button washer head screw will form a check valve for the incoming wort. Giving the cane a few strokes (think shake-weight jiggling) will pull the wort up to the elbow where it will run into the silicone hose and build a steady suction typical for auto-siphons used by homebrewers. BYO

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BY HANNAH CAMPBELL

AN ODE TO OKTOBERFEST

Bringing it back through memories

Covid has given me time to reflect back on some of my best memories. Near the top of that list stands Oktoberfest in Munich, 1977. I remember it like it was yesterday; as if those memories are tangible in my mind.

Oktoberfest 2021 in Munich is cancelled, but if you plan to go next year, this event is the purest definition of enjoying amazing beer, a true feast, surrounded by fellow tourists (and some Germans) in huge tents singing *"Ein Prosit, Ein Prosit"* — a toast to cheer and good times. Liter-sized mugs and traditional steins are hefted by waitresses in dirndl dresses and waiters in lederhosen and feathered alpine hats. Good cheer, merriment, and *willkommen* spirit is heartfelt, shared, and genuine. And I, at the age of 26, had an epiphany when sipping my first beer, Löwenbräu.

Neither my best friend Nancy nor I drank beer, but we were young, adventurous, and impulsive. So when a reasonably priced charter from Philadelphia, Pennsylvania to Munich enticed us to escape to Europe (and escape our parents) we hopped on. Oktoberfest was alluring enough for us. Arriving in Munich, there wasn't one car, scooter, nor bike for rent — mass transit was still not an effective means to get around in those days. Luckily for us, we befriended neighbors on the plane ride, Colonel Joseph Hennegan of the U.S. Marine Corps and his wife Betty, who made some phones calls to friends and got us a Mercedes Benz on loan! The car gave us the freedom to see the beauty of Munich . . . so clean, organized, and encircled by shiny, clear lakes and chalets, which reminded me of a Christmas card — but without the snow. We shopped in cheese stores, we lunched on the best liverwurst sandwiches ever, dined on pizza, Chinese food, and sipped on wines from the Mosel region of Germany.

When the Oktoberfest parades began throughout the city, pomp and pageantry combined with oom-pah-pah music blasting from tubas and accordions as ponies wearing colorful apple/fruit wreaths around their necks pulled carts adorned with fruits, flowers, and vegetables, all as fresh and beautiful as a painting. Women danced the polka around the parade route twirling in calico gowns, checkered aprons, and long braids beneath lace caps while their mustached male partners looked spiffy in forest green suits. Children bent over the geranium plant window boxes, waving to revelers below. I felt as if I were living inside a cuckoo clock.

Beer halls were huge tents with tables covered with Frisbee-sized Bavarian pretzels along with snake-sized sausages and potatoes. Ah, but the icy, chilled mugs so easily armed by waitresses took two hands for me to hold. As custom dictates, only beer from Munich breweries were served in the Wiesn: Augustiner-Bräu, Hacker-Pschorr, Hofbräu, Löwenbräu, Paulaner, and Spaten. And that epiphany I had . . . that this is what real beer is supposed to taste like. Not the watery, lifeless stuff my dad always drank after work.

This 100% Irish-American grandmother now only occasionally drinks beer, but one tradition that I have kept is to get a 6-pack of Löwenbräu Oktoberfest every September. Maybe it's not the taste of the beer I truly long for, but the knowledge I had one of the best times of my life being introduced to the glory and talent that goes into a great mug of beer and the beauty of a great brewing region and its traditions. So this late-September or early-October, raise a homebrew in toast to this great celebration of life and to the 187th Oktoberfest that awaits you in 2022.

Ah, but the icy, chilled mugs so easily armed by waitresses took two hands for me to hold.

Photo courtesy of Hannah Campbell

The author and an unknown fellow Oktoberfest reveler enjoying the feast in 1977.

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