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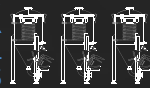
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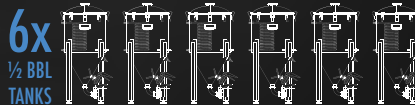
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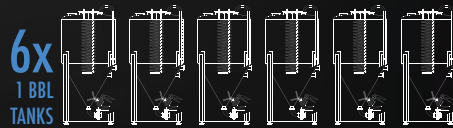
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## RECIPE STANDARDIZATION

### 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.

28





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**EDITOR**

Dawson Raspuzzi

**ASSISTANT EDITOR**

Dave Green

**DESIGN**

Open Look

**TECHNICAL EDITOR**

Ashton Lewis

**CONTRIBUTING WRITERS**

Drew Beechum, Michael Bury,  
Denny Conn, Terry Foster,  
**Colin Kaminski**,  
Brad Smith, Gordon Strong

**CONTRIBUTING ARTISTS**

Shawn Turner, Jim Woodward,  
Chris Champagne

**CONTRIBUTING PHOTOGRAPHERS**

Charles A. Parker, Les Jørgensen

**EDITORIAL REVIEW BOARD**

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Supply

**David Wills** • Freshops

**EDITORIAL & ADVERTISING OFFICE**

**Brew Your Own**

5515 Main Street

Manchester Center, VT 05255

Tel: (802) 362-3981 Fax: (802) 362-2377

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**Q**

**Do you prefer  
brewing alone  
or with a group  
of friends/  
family?**

*I have always liked  
brewing with a  
guest, whether that  
is a teacher, a student,  
or collaboration. The  
interaction always serves  
to teach me something  
new or give me a new  
way of thinking of things.*

*I prefer to brew  
alone. It's my time  
to read, to listen or  
not listen to music  
and concentrate on  
brewing the batch. I  
like it to bathroom  
time — leave me  
alone while I tend  
to my business!*

*Alone. I spend  
enough time with  
the people who like  
to drink my beer.  
They never seem to  
leave ...*

**PUBLISHER**

Brad Ring

**ASSOCIATE PUBLISHER  
& ADVERTISING DIRECTOR**

Kiev Rattee

**ADVERTISING SALES  
COORDINATOR**

Dave Green

**EVENTS MANAGER**

Jannell Kristiansen

**BOOKKEEPER**

Faith Alberti

**WEBSTORE MANAGER**

Julie Ring

**PRINT SUBSCRIPTION  
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**ADVERTISING CONTACT:**

Kiev Rattee (kiev@byo.com)

**EDITORIAL CONTACT:**

Dawson Raspuzzi (dawson@byo.com)



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**Electric  
Brewing Q&A**

Kal Wallner, the  
creator of The  
Electric Brewery

and *BYO* Editorial Review Board member, as well as Trent Neutgens, the creator of the all-electric all-grain brewing setup featured in the January-February 2015 issue of *BYO*, took over *Byo.com* for a live chat about electric brewing. Check it out. <https://byo.com/article/electric-brewing-q-a/>

**MEMBERS ONLY**



**Brewing Scottish  
Ales: Tips from  
the Pros**

Big and malty (and not so hoppy), Scottish ale isn't your typical ale. In this article, three masters of the US craft brewing scene offer some advice for brewing the best Scottish ale possible. <https://byo.com/article/tips-from-the-pros/>



**The Business  
Case for the  
Nano**

Nanobrewing equipment has much more in common with a homebrewing set-up than most of the 10-20 BBL systems used in brewpubs and smaller packaging breweries. Similarities with homebrewing equipment, equipment availability, and relative simplicity of the business model, are attracting many homebrewers to nanobrewing. <https://byo.com/article/nanobrewing-business-case-nano/>

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## BELL'S HOPSLAM CLONE QUESTION

I plugged this recipe (from the December 2018 issue of *Brew Your Own*) into Beersmith and it comes in at 38 IBU. The magazine article shows it to be 65+ IBU. What gives?

Julian Sandoval • via e-mail

BYO Recipe Editor Dave Green responds, “One of the big contributors to IBUs that can fly under the radar from traditional recipe calculators is the late hop additions and their subsequent resident time with the wort before chilling. So, for example, the 2 oz. (56 g) Amarillo® hop addition that you are adding at the end of the boil will be in the hot wort for 15 minutes prior to chilling. The IBUs in the wort will rise considerably during this time. Even if you cool the wort down during this whirlpool phase to temperatures below where iso-alpha acid conversion is taking place in a meaningful way, the hops would still be adding bittering compounds to the wort. The same thing happens during the dry hopping of the beer. Even if you added no hops to the boil, big IPAs generally still end up with 50–60 IBUs with large late hopping and dry hopping additions. Michael Tonsmeire wrote a great article explaining this in the “Advanced Brewing” column from March–April 2018. Digital members can read the article online at: <https://byo.com/article/ibus-modern-beers-old-formulas-advanced-brewing/>.”

## TIPS FOR PREPARING FOR BJCP EXAMS

Based on my experience with the Beer Judge Certification Program (BJCP) tasting exam (10+ years of teaching, administering and grading, authoring online training materials, and using that knowledge to achieve a Master-level score on the tasting exam), the “Preparing For The BJCP Exam” (July–August 2019) article is mostly on-point, but I did catch one mistake: You don’t need to pass the qualifier exam in order to judge at competitions. Competition organizers are usually looking for judges, and unranked judges are always paired with BJCP-ranked judges. Even if they have enough qualified judges, most organizers are happy to fit in a few motivated and competent novices.

If there’s a perception or fault that eludes you, or if you’re uncertain about a particular beer style, don’t be afraid to ask questions; you’re there to learn. If time allows during judging,



**Richard Taylor** is a beer writer based in Edinburgh, Scotland. He is a member of the British Guild of Beer Writers and has written for several beer-related publications. Since 2014 he has worked for BrewDog; producing BrewDog’s blog, magazine *Hop Propaganda*, label copy, beer mats, and pretty much anything involving clacking on a keyboard. In 2017 Richard’s first book *Craft Beer for the People* was released. He also writes about Scottish brewing and beer for his blog *The BeerCast*, which won the Brains SA Gold Award for online media at the British Guild of Beer Writers’ Awards. Richard also judges beer, including at the World Beer Awards and numerous Society of Independent Brewers (SIBA) and Campaign for Real Ale (CAMRA) beer competitions.

Beginning on page 62, Richard makes his *BYO* writing debut exploring the Scottish beer scene and the explosion of craft breweries that have revolutionized beer there over the past decade.



**Derek Dellinger** is a writer and brewer living in New York’s Hudson Valley. Previously the Head Brewer for Kent Falls Brewing in Kent, Connecticut, Derek now works as a consultant to breweries and cideries in the region. His first book, *The Fermented Man* (Overlook Press, 2016), explored the concept of living entirely off of fermented food and drinks for a year. He has also published books on hiking, with the next *America’s Best Day Hikes: Spectacular Single-Day Hikes Across the States* to be released this fall.

In this issue, Derek shares techniques and recipes for brewing beer-wine hybrids, beginning on page 76.



**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 is also a past *BYO* Boot Camp Speaker, and will be leading the “Advanced All-Grain Techniques” Boot Camps in Denver, Colorado on March 26–28, 2020.

In addition to his “Style Profile” column on rauchbier (page 28), Gordon also explores the history and nuances of traditional Scottish beer beginning on page 52.



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and if you're paired with someone who achieved a score of 80+ on the tasting exam (this includes all National or higher judges who got their rank within the last five years) ask to see your partner's score sheets. They should be good examples of what a well-written and complete score sheet looks like.

Judging also provides the chance to taste off-flavors across a variety of beer styles. This is vital since tasting spiked beer doesn't give you the same experience as encountering off-flavors "in the wild." If you're lucky, you might get a great example of a beer style you can't get commercially.

Finally, competitions always have lots of leftover beer, representing entries that didn't advance to the Best of Show round. I often use leftover competition beers as examples of obscure styles or to demonstrate certain faults.

**Thomas Barnes (BJCP National)** • *via e-mail*

*Great points, Thomas! The more you taste beer, the better an understanding you will obtain. If someone is practicing for the BJCP exam and can find a competition in which they can be a judge, the experience should prove very valuable.*

### **BEYOND THE BARREL LOVE**

*We've received a few emails from readers sharing success stories for Andrew Reudink's recipes from "Beyond the Barrel," in the*

*January-February 2019 issue. Here are two of them:*

I just wanted to let you know I brewed a batch of the Abysmal Stout using the A10 Imperial yeast back in January in order to have ready for Christmas. They are bottle conditioning and I tried one tonight to see how they are coming along. I was quite blown away by just how delicious this beer is already. I can't wait to see what it will be like at the end of the year. Please tell Andrew Reudink that I said "thank you" for the recipe. It is simply incredible. I was a little concerned as I have never used licorice root in a beer before, but DAMN this beer is delicious.

**Charles Carter** • *via e-mail*

Just read the July-August 2019 *BYO* that listed my question in the "Mail" section. Glad to report that the Vin Blanc IPA turned out fantastic. I did change a couple things in the recipe based on the ingredients that I had. I added 2 cups of white wine in the keg and added another cup a few weeks later to bring out a little more wine flavor. I entered the beer in a couple of local competitions and won a silver and bronze in the "Wood-aged" category.

Thanks for a great recipe. I will most definitely be brewing this one again.

**Chris Hughes** • *Toronto, Ontario* 

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## BEGINNER'S BLOCK

BY DAVE GREEN

# WHEN THE TRUB BREAKS

Collectively we call it the trub, but generally the gunk that lands at the bottom of your brew kettle at the end of the day can be broken down into three distinct types: Hot break, cold break, and hop debris. Some brewers go to great lengths to try to remove as much trub as possible before fermentation starts, while others will have their beer on trub right up until packaging time. I'll try to sort through some of the information on what trub is and when it may be helpful or when it could be detrimental to your beer.

So let me start out by describing the three trub types. First up is the hot break, which begins to form as the wort in the kettle heats up towards the boil. This often looks like the coagulated egg in egg drop soup in your boil kettle. Meanwhile the cold break forms after the boil as the wort goes through the chilling process. Both types of break are generally protein-based material that has fallen out of solution. The hop debris is the remaining vegetal matter from hops that were added during the brewing process.

### BREAKING IT DOWN

The two forms of break are mainly malt-derived proteins that cluster together. There are some other non-protein compounds that can be found in the break, but the majority of the two forms of break are made up of protein, roughly 50% of hot break and 60% of cold break. According to an analysis done by the Siebel Institute, polyphenolic compounds make up a large portion of the cold break material as well while fatty acids can make up a decent portion of the hot break material. Clumps of break form because of portions of the long protein chains that are oil-loving (hydrophobic) cluster together. Other hydrophobic material, like fatty acids, will join in the mix as well.

Boilovers usually occur thanks to proteins. But as the proteins clump and the hot break develops very early in the boil, the break material becomes heavier and falls back into the wort instead of being lifted into suspension as foam. This is why boilovers generally are the biggest concern right as the boil commences. The pH of the wort does matter and stronger hot breaks occur with lower-pH worts. If you're an all-grain brewer and not seeing good-sized hot break, your wort's pH may be too high and a look at water chemistry may be in order. Some homebrewers will skim the dark-colored foam that forms early in the boil kettle's foam process, but there is little evidence that supports that this removal improves the final beer.

Cold break forms as the wort is quickly chilled, shocking more proteins to break out of solution. This can often be aided by polyphenolic compounds from hops and finings, such as PVPP and tannic acid. Irish moss, aka carrageenan, also improves the formation of cold break. Cold break is often fairly nutrient-rich so many brewers may want to keep cold break in the fermenter for yeast health reasons. Some of the cold break may be reabsorbed into solution and contribute to chill haze later in the beer's life, so some brewers may opt to dump the cold break. More on this in the next section.

Hop debris is something that many brewers want to leave behind in the kettle or container to keep the debris separate from the wort as it goes into the fermenter. Just as many brewers don't want beer to be in contact with dry hops for an extended period of time, too much vegetative compounds can be detrimental to the final beer. Some brewers use hop filters, steel baskets, or hop spiders to make sure the hop debris remains in the kettle.

### TRUB MANAGEMENT

Trub volume is influenced by the amounts of trub "ingredients." Things that tend to increase trub volume include increasing the wort's original gravity, high protein ingredients (such as wheat), and high hopping rates. Since an increase in trub volume usually increases wort loss, brewers may want to focus on reducing trub volume. This can be accomplished by increasing the trub density. So how can you increase trub density? First is through the use of certain kettle finings, such as PVPP or similar products that promote settling. Second is by allowing a settling time. Reed Antis of the homebrew shop Saratoga Zymurgist suggests one hour of cold wort settling in the kettle prior to racking into the fermenter.

If a lot of trub is brought over into the fermenter, brewers can still perform trub management. Brewers with conical fermenters can dump the settled trub out of the bottom of the fermenter. Others may want to rack the wort off the trub into a second fermenter after settling. Another form of trub management is skimming the "*Braun Hefe*" or brown yeast that rises to the top of the kräusen during fermentation. If you do go to lengths to remove the wort from the trub, there is a reward and a risk. First, you are likely going to be lowering your fusel alcohol level and slightly increasing ester levels in the final beer. This is your reward as fusel alcohols are considered a fault and esters are often an asset. But if you do completely remove the trub, there is a risk. Without the fatty acids found in the trub, yeast health can suffer. Luckily for us, this can be offset by proper aeration of the wort. So don't skip this step if you're removing the trub. If you don't have the means to properly aerate your wort, then leaving at least the cold break will be beneficial for the beer.





## HOMEBREW DROOL SETUP

JACOB BURNHAM • BREMERTON, WASHINGTON

Like many of us, I have seen videos of the, dare I call it “typical” keezer build project, whereby the lid is temporarily removed, a wooden collar fastened in its place (for mounting faucets), and then the lid is re-assembled on top of the pre-mentioned collar. The simplicity of this concept is great, and is something that serves as a perfect foundation off of which to create more specialized designs. After purchasing a chest freezer (that could comfortably house 6 corny kegs) to establish dimensional constraints, I began with simple concept sketches by hand, and from there produced design drawings using Autocad drafting software. My father is a woodworker and I knew this would be right up our alley, a union of two hobbies if you will. After walking the aisles

of a lumber store with various exotic wood species, I decided to use black walnut with accents of African padouk. We expanded the concept of the “collar” to create an enclosure around the freezer unit (seen in Photo 1), which would allow for fastening of vertical panel faces, side surfaces on which to set one’s drink, as well as provide space for shelving/a cabinet/a drawer. Instead of mounting the faucets to the collar, we chose to build two towers (with three faucets each) on top of the freezer lid, through which beer lines would be fed from the kegs to the faucets. The towers (seen in Photo 2) were framed, enclosed with wood, their inside surfaces covered with rigid insulation, and a removable back piece installed for tough, but manageable

access to the faucet shanks. After all the fun was complete, the unenviable task of staining/finishing presented itself. For high real estate panel surfaces, black walnut veneer plywood was used (equivalent amounts of sawn lumber are super expensive), however the veneer was noticeably lighter in color than the non-veneer pieces (seen in Photo 3). Luckily we chose the perfect stain (Minwax Special Walnut 224) to match the true walnut pieces, followed by a coat of Zinsser wax-free shellac on the Padouk, and finally a coat of Minwax Helmsman spar Urethane over every surface (seen in Photo 4). Six taps/kegs, two drip trays, a CO<sub>2</sub> tank later, and a \$2,500 total equipment/materials bill later, pouring beer never looked so good!

Photo 1



Photo 3



Photo 2



Photo 4



# WHAT'S NEW



## THE NEW IPA: A SCIENTIFIC GUIDE TO HOP AROMA AND FLAVOR

If you are looking to take your IPAs (or any hop-forward beer) to the next level, Scott Janish pored through scientific research that he disseminates into a new hop-lover's compendium.

His blog posts at [scottjanish.com](http://scottjanish.com) have for the past several years been a bastion for those looking to brew hazy style IPAs – with insight into not only the key ingredients for brewing the style, but also techniques and tools that brewers can utilize to get the most out of the style. In *The New IPA*, he refines concepts from his blog and lays them out into an orderly guide for the true hop aficionados. For more information on the book or to order a copy for yourself, visit: <http://scottjanish.com/the-new-ipa-scientific-guide-to-hop-aroma-and-flavor/>



## BTH BREW SUPPLIES GENTLE RAIN FLY SPARGER

The new Gentle Rain Fly Sparger is made for all-grain brewers looking for an effective sparge water dispersal system. Using a six-hole, billet-machined stainless steel nozzle, it comes equipped to connect directly to your hot liquor tank. The 7-piece sparging kit includes an acrylic plate

that fits over most mash tuns, two ½-in. stainless steel disconnects, 24-in. (60-cm) food-grade silicone tubing, and two stainless worm clamps. Tubing can be trimmed to best fit your system. The kit retails for \$48.99 and the steel nozzle can be purchased separately. Find out more at [www.bthbrewsupplies.com](http://www.bthbrewsupplies.com)



## THE ANVIL FOUNDRY™

This new all-in-one brewing system features an ultra low-watt density, triple element heater in order to prevent scorching. Currently available in two sizes,

a 10.5-gallon (40-L) model to produce 5-gallon (19-L) batches and a 6.5-gallon (24.6-L) model, which produces 3-gallon (11-L) batches. The Foundry can switch between 120V, 1600W, 13A rating and 240V, 2800W, 12A rating if the brewer is looking for faster heating times. The high flow grain basket is designed to eliminate stuck mashes and the large capacity increases efficiency. The unit comes with an immersion chiller with hoses and fittings. Optional recirculation pump kit and a distillation kit are available as well. Units start at \$274.99. Learn more at [www.anvilbrewing.com](http://www.anvilbrewing.com).

## 2019 SOUTHERN HEMISPHERE HOP HARVEST REPORT



### Australia Report:

In a report put out by HPA (Hop Products Australia), the three farms they oversee saw a 13% year over year increase in production. This

included increases across their proprietary hop varieties, with an 8.6% increase in Galaxy™, a 10.8% increase in Vic Secret™, and a 125% increase in their newest proprietary hop variety Enigma™.

“This year’s production volume allowed us to meet contractual obligations across all varieties. All three farms endured major weather events during the growing season. Our Victorian farms – Rostrevor Hop Gardens and Buffalo Valley – experienced extended periods of heatwave conditions through which our irrigation systems performed well, preventing impact on yield. Tasmania experienced widespread bushfires throughout January when the majority of the crop at Bushy Park Estates was still in burr. Although these conditions did not affect yield, they are indicative of the hot and dry conditions that characterised this season.”



### New Zealand Report:

According to Doug Donelan, CEO of New Zealand Hops Limited:

“Harvest conditions were good commencing in late February and

running through to the start of April. Overall harvest quality was very pleasing in a year that saw a significant increase in the cooperatives planted area. Yields were below average on the whole and this is mostly attributable to the large number of baby plants on new ground. High summer temperatures and long dry spells without rainfall also impacted cone development in some varieties, however others, especially early types like Motueka™ responded well to the conditions as did Rakau™ and Waimea™. Aroma intensity scores were high on average throughout grading and selection with Nelson Sauvin™, Riwaka™ and Moutere™ really standing up well to the conditions. Harvest volumes are set to increase further in coming seasons as new plantings continue to mature and further developments and expansion on planted areas continue.”



### South Africa Report:

According to importer Greg Crum of ZA Hops: “In general, the yield for 2019 was about 5% less than expected. While not great, it is better than for 2018. 2019 also brought a

second straight year of drought, though drought conditions were not as bad as for 2018. Farms that had adequate water in their reservoirs fared better than those who didn't. For example, one farm ran out of water about two months prior to harvest and their crop of Southern Passion was rejected. South African hops will be available this year in North America through ZA Hops with sales to homebrewers via a new commerce website.” *Direct-to-consumer commerce site was still in development during production of this piece.*



# CLEAN BEER



# STARTS HERE



Trusted by homebrewers since 1980

**DEAR REPLICATOR,** Many moons ago I made the trek to San Diego, California (from Minnesota) on a beer-vacation masquerading as a family trip to Sea World/San Diego Zoo. That may be a stretch as my wife and daughter gave me one day to hit the breweries in and around the city. The one stop I had to make, based on reputation alone, was Port Brewing Co./The Lost Abbey. Of all the amazing beer on tap, Ten Commandments really stuck out. Ten Commandments is a dark, farmhouse ale with a notable *Brett* character. After a few trial batches at home, it's fair to say I am not even close. Given the complexity, multiple ingredients, and yeast strains, can you help me unravel this amazing beer?

Tom Ferris  
Kasson, Minnesota



The Lost Abbey  
BREWING COMPANY

**T**om, you're absolutely right! Ten Commandments from The Lost Abbey is an amazing beer, which I've been fortunate enough to drink, but it's also devilishly difficult to craft. Even Tomme Arthur, who's The Lost Abbey's Director of Brewing Operations and a co-Founder, mentioned to me that it's a "very challenging beer." So here's to hoping that this article sheds a bit of light on this dark, farmhouse ale.

Just for clarity, The Lost Abbey/Port Brewing Co./The Hop Concept all share a roof and brewery space in San Marcos, California, which is just north of San Diego. Despite sharing the 3-vessel, 30-BBL brewhouse, each brand of beer focuses on segregated styles. The Hop Concept focuses on hoppy flavors and combinations thereof without the trappings of having to use specific hop varieties. Port Brewing's attention is devoted on aggressive San Diego/West Coast beer styles, while The Lost Abbey devotes itself to Belgian-inspired ales. Although The Lost Abbey's beers are fundamentally derived from classic Belgian styles such as dubbels, quads, and saisons, you'll find the beers to be anything but traditional. Consider them to be quaffable, culinary experiences.

The concept of The Lost Abbey was the brainchild of Vince Marsaglia's imagination: Flavorful, expressive brews with a nod to monastic brewing traditions and styles. The one setback was finding a brewer who could pull off such a feat. In 1997, Tomme entered the picture and rapidly began producing flavorful beers at Pizza Port, which was founded by Gina Marsaglia,

Vince's sister and one of the individuals responsible for bringing good beer to San Diego back in 1987 when the craft beer industry was still young.

After several successful years, Tomme and Pizza Port had firmly established themselves in the beer world and began to formulate plans to bring Vince's idea to fruition. The next step would be the acquisition of a brewing space to support such an endeavor. And as luck would have it, Stone Brewing Co. vacated a space in San Marcos in 2005 to move into another, larger space a short distance away. Gina, Vince, and Tomme pounced. The Lost Abbey's doors opened in May 2006 and in the following year, Port Brewing was named the Great American Beer Festival (GABF) Small Brewery of the Year while Tomme took honors as Small Brewer of the Year. In 2008, they were similarly awarded again but at the World Beer Cup and the trend of award-winning brews continued for nearly the next decade. Currently, the brewhouse puts out 15,000 BBLs per year to help fill the nearly 1,000 Bourbon, brandy, Sherry, and wine barrels that The Lost Abbey owns.

Despite drinking The Lost Abbey's beers for a few years, there are several aspects of the brewery that I never knew. First off, look at their logo, which was created by Sean Dominguez. Each arm of the Celtic cross bears one of the four main ingredients in beer: Yeast, water, malt, and hops. The cross is surrounded by a circle that "joins the four points of the cross with a fifth element that we believe represents

the spirit of the people that energize The Lost Abbey on a daily basis." The Lost Abbey also has a version of their Ten Commandments with considerably fewer religious implications. It's a set of rules that helps to guide them, contains a bit of seriousness and has a sprinkle of humor thrown in. For example, Commandment VIII states, "We believe an inspired life is worth living," while Commandment VII is, "Passion isn't something you can buy at the corner store."

Ten Commandments is a multi-layered beer that changes like a chameleon as it warms. The beer is best enjoyed at cellar temperatures to truly bring out the complexities of flavor found in the beer. It's also a pseudo-celebration of their anniversary since it usually arrives in stores annually in the June–July timeframe. You can enjoy it on its own or pair with a hardy, robust dish such as a stew. In the nose, you'll find quite a bit of caramel candy, honey, raisin, chocolate with supportive herby rosemary, peppery spice, and restrained funky notes from the *Brettanomyces*. The flavor follows the nose for the most part and starts out a bit on the sweet side, which tails off in a long, drying finish. Pepper, funk, caramel, and raisin linger on the palate.

As you could imagine, Ten Commandments is also a fine beer for proper cellaring techniques should you have the patience not to drink it. So, go ahead, brew up your version of it, drink some of it now and savor a portion in the distant future. Cheers!



## THE LOST ABBEY BREWING COMPANY'S TEN COMMANDMENTS CLONE



(5 gallons/19 L, all-grain)  
OG = 1.089 FG = 1.006  
IBU = 34 SRM = 33 ABV = 11%

### INGREDIENTS

10 lbs. (4.54 kg) 2-row pale malt  
1.5 lbs. (0.68 kg) crystal wheat malt  
(55 °L)  
0.75 lb. (0.34 kg) Special B malt  
0.75 lb. (0.34 kg) melanoidin malt  
0.75 lb. (0.34 kg) flaked barley  
0.4 lb. (0.18 kg) Carafa® II malt  
1.4 lbs. (0.64 kg) corn sugar  
1.4 lbs. (0.64 kg) honey  
6.75 AAU Amarillo® hops (90 min.)  
(0.75 oz./21 g at 9% alpha acids)  
3.25 AAU Magnum hops (45 min.)  
(0.25 oz./7 g at 13% alpha acids)  
5 oz. (142 g) blackened raisins (see  
Tips for Success)  
0.5 oz. (14 g) sweet orange peel  
0.026 oz. (0.75 g) fresh rosemary  
WLP565 (Belgian Saison) or Wyeast  
3724 (Belgian Saison) yeast  
WLP650 (*Brettanomyces bruxellen-  
sis*) or Wyeast 5112 (*Brettanomy-  
ces bruxellensis*) yeast  
1 cup corn sugar (if priming)

### STEP BY STEP

Mill the grains, then mix with 4.4 gallons (16.7 L) of 166 °F (74 °C) strike water to achieve a single infusion rest temperature of 152 °F (67 °C). Hold at this temperature for 60 minutes. Mashout to 170 °F (77 °C).

Vorlauf until your runnings are clear before directing them to your boil kettle. Batch or fly sparge the mash to obtain 7 gallons (26.5 L) of wort. Boil for 90 minutes, adding hops at the times indicated above left in the boil. At 15 minutes left in the boil, you can add Irish moss or Whirlfloc as kettle fining agents.

After the boil, add the corn sugar, honey, raisins, orange peel, and rosemary. Whirlpool for 15–20 minutes before chilling the wort to slightly below fermentation temperature. Pitch saison yeast. Start fermentation around 75 °F (24 °C) and ramp up as it goes. Ferment to completion,

which may require a bit of patience and time. Bottle or keg the beer and carbonate to approximately three volumes using Brett Brux yeast.

## THE LOST ABBEY BREWING COMPANY'S TEN COMMANDMENTS CLONE



(5 gallons/19 L, extract with grains)  
OG = 1.089 FG = 1.006  
IBU = 34 SRM = 29 ABV = 11 %

### INGREDIENTS

5.5 lbs. (4.54 kg) extra light dried malt extract  
1.5 lbs. (0.68 kg) crystal wheat malt  
(55 °L)  
0.75 lb. (0.34 kg) Special B malt  
0.75 lb. (0.34 kg) melanoidin malt  
0.75 lb. (0.34 kg) flaked barley  
0.4 lb. (0.18 kg) Carafa® II malt  
1.4 lbs. (0.64 kg) corn sugar  
1.4 lbs. (0.64 kg) honey  
6.75 AAU Amarillo® hops (60 min.)  
(0.8 oz./23 g at 9% alpha acids)  
3.25 AAU Magnum hops (45 min.)  
(0.25 oz./7 g at 13% alpha acids)  
5 oz. (142 g) blackened raisins  
0.5 oz. (14 g) sweet orange peel  
0.026 oz. (0.75 g) fresh rosemary  
WLP565 (Belgian Saison) or Wyeast  
3724 (Belgian Saison) yeast  
WLP650 (*Brettanomyces bruxellen-  
sis*) or Wyeast 5112 (*Brettanomy-  
ces bruxellensis*) yeast  
1 cup corn sugar (if priming)

### STEP BY STEP

Bring 2.5 gallons (9.5 L) of water to roughly 152 °F (67 °C). Steep all the milled malt in a nylon bag for 30 minutes then remove. Allow the bag to drain back into the kettle. Add enough water to bring the total volume to 6.5 gallons (24.6 L). Add the dried malt extract, stir, and finally heat to a boil. Follow the all-grain recipe for remaining boil, fermentation, and packaging instructions.

### TIPS FOR SUCCESS:

Ten Commandments will surely test your faith in microbiota. The brew day should be relatively straightforward except for the blackened raisins and rosemary. A subtle hand is

needed for the rosemary addition as too much of the herb will unbalance the beer; The Lost Abbey uses 4 oz. (113 g) in 25 BBLs (775 gallons/29 hectoliters) of wort. As for the raisins, you're looking for a pleasantly caramelized character that you get via brûléage the raisins. Lost Abbey uses a large torch to accomplish this task but feel free to use safer alternatives such as a broiler.

The other major difficulty with this beer is the fermentation. The DuPont strain is notorious for stalling around 1.030. However, with a bit of patience and heat, it'll start back up and finish fermenting. Note that the strain can tolerate fermentation temperatures up to 90 °F (32 °C). Finally, the beer is carbonated and conditioned using Brett Brux yeast. If you decide to keg the beer, you may want to consider using a funky, dedicated *Brett* or sour keg. Tomme recommends patience...all the flavors in the beer take months to meld together.



# TIPS FROM THE PROS

BY DAWSON RASPUZZI

## TWO BREWS

### Incorporating coffee into beer

*They are, personally, my two favorite beverages, and I know I'm not alone here. So, of course it makes sense to combine coffee and beer. It wasn't too long ago that the addition of coffee meant you were drinking a stout or porter. But today, brewers are finding creative ways to successfully incorporate coffee into all styles of beer. Get tips on how to do it from three pros that know their way around the Joe.*

Freshly roasted, high-quality beans are a must in making great tasting coffee beers.

The idea behind our coffee lager, First Call, is to present a new take on what we perceive a coffee beer to be. For First Call, we are going for big coffee aromas and flavor, while keeping the drinkability and refreshing qualities in a crispy lager. We want to make sure it looks like an ordinary pale yellow lager so the drinker gets that double take/mind blown moment when drinking it. This makes the coffee addition tricky, as you want the beans to contribute flavor and aroma, without turning the beer into a brownish shade.

We add ground coffee beans directly to the fermenter with our dry hopping (DH) cart and use the beer itself to do a cold pressing (instead of cold pressing in water). This hybrid cold press/dry beaning process maximizes flavor and aroma of the coffee while keeping color contribution very low in the finished beer. Also, we keep our dissolved oxygen levels extremely low since we can purge unwanted oxygen out of the coffee by using our DH cart. This process is also highly efficient while maintaining our quality and safety standards.

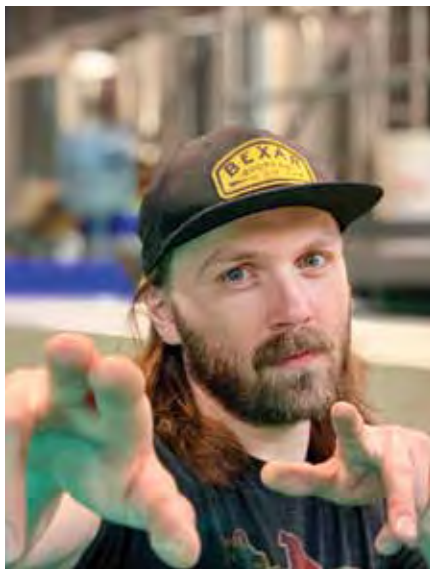
For this recipe, we add 2 lbs. per barrel (about 1 oz. per gallon/7.5 g per L); of course this is taking into account our custom roast profile and process. We do the coffee addition after the beer finishes lagering, passes diacetyl testing, and is crashed at 32 °F (0 °C) for 12–18 hours. We add the coffee at this stage to get a smoother flavor that has a less roasty acidic bite and fresh ground coffee aroma. Our centrifuge makes removing the coffee extremely easy while spinning out more coffee flavor from the grounds.

Prior to settling on this coffee ad-

dition method we tried multiple processes — hanging bags, whole beans, ground beans, and more traditional concentrated cold brew additions. All worked, yet turned out to be a quality issue, safety issue, or just a complete sh\*tshow. Hot brewed coffee or adding coffee to the kettle or whirlpool did not give us the flavors we are striving for. Those flavors tend to be astringent and over processed with low aroma in the final beer.

Freshly roasted, high-quality beans are a must in making great tasting coffee beers. We collaborated with our local roaster to pick our beans and develop a custom roast profile that pairs well with the First Call base beer. Together we chose multiple beans from different origins and then roasted each to different levels and extracted them with fresh First Call in crowlers for mini representations for each coffee until we found the one. The roast has to be dialed since there are not any caramel/roasted malts to hide behind with a coffee lager. You can get a green coffee bean flavor (think green pepper and peanut butter) if your roast is too light or, at the other end of the spectrum, heavy roasted astringency if the roast is too dark.

Other than selecting the right coffee, there are a few other considerations during recipe development that are unique for coffee beers. We adjust the overall pH to compensate for the acidity of the coffee addition. Also we add oats and a touch of milk sugar to bring a soft creaminess to the mouthfeel of the beer, while still maintaining a crisp and refreshing finish. This all played very well together with the bold coffee flavor and aroma.



*Keigan Knee is the Head Brewer and Co-Owner of Modist Brewing Co. in Minneapolis, Minnesota. Keigan has been brewing professionally for over nine years in the Minneapolis area with a focus on creating new beer experiences and flavors that combine limitless creativity with the dedication of tradition. His First Call coffee lager won bronze in the Coffee Beer category of the 2018 Great American Beer Festival.*





Jean-François started out as a homebrewer in 1992. After completing a bachelor's degree in biology in 1996 at the Université du Québec à Montréal (UQAM), specializing in biotechnology, he and his partners founded Dieu du Ciel! Brewpub in Montreal, Quebec in 1998, where he remains the Head Brewer. In 2007, Dieu du Ciel! Expanded to add a packaging brewery located in St-Jérôme, Quebec.

When I set out to design Pêché Mortel in 2001, most of the coffee stouts or coffee porters available were kind of disappointing. Often it was a beer with only roasted grains used to give some coffee character, or a beer with just little bit of coffee added. As a coffee aficionado, I wanted to do a beer that wouldn't leave you guessing. I went with an imperial stout, figuring that it would need to be a beer with enough structure to support the character of the coffee. I wanted to have the roasted character up front, supported by a good body and balanced with a solid bitterness. The idea is to have harmony between the toasted barley, the torrified malt, and the coffee.

There are two schools of thought about how to add coffee to beer – cold or hot. Cold extraction is great for aroma, but my feeling is that if your goal is to get coffee flavor into your beer, the hot side is better. We designed a special tank to run the hot wort through the coarsely ground coffee beans to get the flavor we are seeking. The hot wort is in contact with the coffee beans for a matter of minutes. For this method, at 1.3 oz./gallon (10 g/L), the coffee character will be very delicate, so I'd recommend

using 2–3.3 oz./gallon (15–25 g/L) for a more profound taste. For our barrel-aged version we do a second cold-side addition of coffee beans before bottling, and we've found that 24 to 48 hours is enough time.

We're now planning some non-stout coffee beers that will utilize our hopgun on the cold-side. The idea is to run the beer through the coffee until we get the flavor we want. I've also used the mash tun to mix coarsely ground coffee with hot water before running it through the lauter tun. You need to have some sort of strainer before the heat exchanger to avoid blocking it, but with some fine-tuning this method works well.

The type of coffee you use will definitely leave its mark on your beer. We blend two different roasts to achieve the perfect balance. For our Pêché Day one-offs we play around with coffees.

My other advice for homebrewers is don't use too much highly torrified grain so that the coffee can shine through the beer. And if you want to go with the hot extraction, make sure not to burn your coffee; let the wort cool a little bit and don't leave the coffee in contact too long. It's better to under extract than over extract.




Gordon Whelpley is the Head Brewer at Stony Creek Brewery in Branford, Connecticut. He's worked at Magic Hat, El Segundo, and interned at Monkish. He's a graduate of UC-San Diego's Brewing Science and Technology program and is a Certified Cicerone. Stony Creek's Stony Joe won bronze in the 2017 Great American Beer Festival.

Stony Joe is a golden mocha stout. The idea behind it was to make a mindf\*ck of a beer – one that makes you question whether your server messed up until you take a sip. We used coffee and cacao nibs to give a light beer loads of rich “dark” character.

We work closely with Redding Roasters (in Bethel, CT) to have fresh roasted and freshly ground (morning of) Arabica coffee, which is added after the beer has cleared a forced diacetyl test at 38 °F (3 °C) Then we add the ground beans at a rate of 1 lb. per barrel (approximately ½ oz. per gallon/3.7 g per L) into the fermentation vessel for no more than 24 hours. The reason we ended up going with coarse ground, fresh roasted (unrested) coffee was to add the coffee while it was still heavily degassing. This has the two-fold benefit of lowering dissolved oxygen pickup and accelerating the flavor extraction process. We've found that longer contact

time with coffee lends itself to more green pepper character, which isn't what we're going for.

The coffee's type, roast level, roaster, etc. is very important to the final beer. We went deep down the rabbit hole with our friends at Redding Roasters to select the right coffee for this beer. We ended up settling on a single-origin bean from Guatemala that was low-acid and complementary to the cacao nibs and malt profile. For this recipe, we also use lactose, which acts as the most important buffer against any harsh coffee tones in this beer. The beer is also about 25% flaked adjuncts; so its inherent “creaminess” strikes a nice balance.

In addition to the popular Stony Joe, we also do an imperial version of this beer, for which we barrel age green coffee beans for several months prior to roasting. We double our coffee and cacao additions to the imperial as well. This has added a whole new dimension of complexity to the final product. 

# Demystifying ACTIVE DRY YEAST

by Fermentis

text written by José Pizarro,  
Kevin Lane, and Marcelo Cerdán

Active Dry Yeast (ADY) is a topic which has always intrigued the homebrew community. It does not take long to figure out that there are a lot of myths surrounding ADY and its use. One example relates to active dry yeast preparation prior to pitching – should I rehydrate or not? Information on the internet tells you that there are as many answers to this question as there are web pages! Throughout this article we will discuss several topics about Fermentis' ADY from a manufacturer's point of view.

## A LITTLE BIT OF HISTORY

Brewing yeast strains have gone through a long domestication process. For those who want to dive more into science and know more about industrial yeast phylogeny, including brewing strains, we recommend reading two recent papers, both describing how this process occurred: Gallone et al. *Domestication and Divergence of Saccharomyces cerevisiae Beer Yeasts*. 2016. Cell 166. 1397–1410; Gonçalves et al. *Distinct Domestication Trajectories in Top-Fermenting Beer Yeasts and Wine Yeasts*. 2016. Current Biology 26. 2750–2761. The domestication process was driven by ancient brewmasters and contributed to generate all the diversity in this industry today. In other words, brewers have driven the evolution and diversification of these strains inside the breweries, unconsciously shaping the yeast to their needs. Nature also influenced this process, for example allowing inter and intra species hybridization, like the well-known case of *Saccharomyces pastorianus* (lager yeasts). This di-

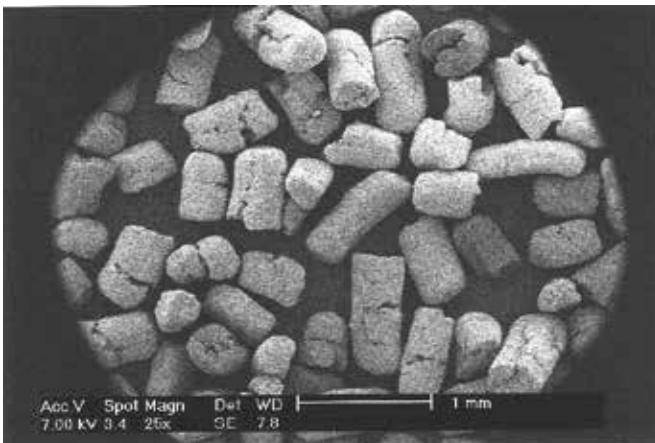


Figure 1 — Optical microscopy image (Gx26) of Active Dry Yeast powder granules prior to packaging

versity is now kept safeguarded in different yeast banks, and our mission is to screen for the most representative strains available and deliver them to the industry in a convenient format to simplify brewers' lives; which is dried yeast, otherwise known as "active dry yeast (ADY)". Although the first yeast biomass culture was dried back in the early 1970s for the baking industry, ale brewing yeast was not dried until 1995, and lager yeast until 1996! Since the late 90's ADY has come a long way and the industry agrees that ADY today has a state-of-the-art quality, but more about that later.

## THE ADY PRODUCTION PROCESS

Fermentis beer yeast strains are produced in one of the Lesaffre plants located in Belgium and specialized in handling multiple strains with high quality standards. The production of Fermentis ADY starts with a laboratory phase where the purity of the yeast coming from our yeasts bank located in Lille (France) is monitored before we ship a slant/slope to our industrial production site. In the plant laboratory, the culture is propagated from the slant in aerobic and constantly monitored conditions. When we have produced enough biomass, the culture is transferred to a bioreactor where industrial production takes place. Propagation is done in state-of-the-art facilities where yeast is grown in fully aerobic conditions, on a balanced nutrient base with molasses as the sugar source (which makes all of our yeasts gluten free). This production process is called fed batch fermentation. Oxygen and sugar levels are critical to control... If interested, please read about the Crabtree Effect. The idea is to produce yeast biomass from all available sugars (energy) and avoid alcoholic fermentation! In other words, we want to use sugars to produce yeast and not alcohol.

Yeast multiplication will be stopped when the desired amount of biomass is grown. At this stage, the yeast physiology is managed to prepare the cells for the next steps and resist the drying process. The yeast culture will then be centrifuged, vacuum filtered and finally dried in a fluidized air bed to reach 94–97% of dry matter. Depending on the target market segment, yeast can be vacuum-packed (500 grs bricks) or packed under inert atmosphere (soft packs, nitrogen flushed (11.5 grs, 5 grs sachets, and smaller)) to protect against oxidation and moisture.

As you can guess, the details of the production process are a secret known only by a few people in this world but be assured that parameters are constantly monitored to provide you with the best yeast. What we can tell you is that each strain has its own "recipe" for the propagation and drying processes; to best grow the yeast in terms of vitality, viability, purity and fermentation re-start. It is the manufacturer know-how which makes the difference and with over 160 years in the business, we have some experience. Also, technology is continuously improving to make



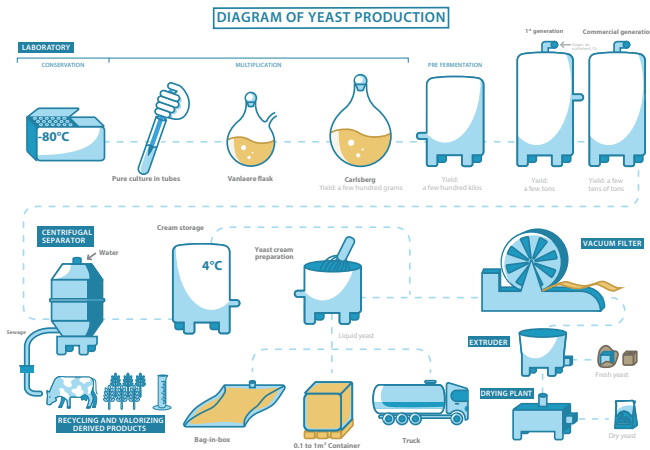


Figure 2 — Production process of Active Dry Yeast (ADY)

the resulting product even better. These improvements allowed us to extend the shelf life to 36 months in 2016, and to launch the Easy-to-Use (E2U™) concept last year for all our brewing yeast strains (see below). You may have been introduced to this in 2018, at the CBC in Nashville or at Homebrew Con in Portland.

## DEMYSTIFYING ACTIVE DRY YEAST

Through this Q&A we will answer most of the questions people have about Fermentis' ADY and explain our Easy-to-Use (E2U™) concept/brand.

### Who are we?

Fermentis is part of the Group Lesaffre, a key global player in yeasts and fermentation. Lesaffre designs, manufactures and markets innovative solutions for Baking, Food Taste & Pleasure, Health Care and Biotechnology. Fermentis is the business unit in charge of fermented beverages (wine, cider, beer, distilled spirits, mead, etc.). In other words, we take care of the most fun part of the business. In all seriousness, Fermentis produces many of the most popular strains for the beer industry like SafAle™ S-04, SafAle™ US-05, SafAle™ WB-06 and SafLager™ W-34/70 to mention a few of the thirteen strains available nowadays in our range.

### What is Active Dry Yeast?

Active Dry Yeast (ADY), as the name states, is dry yeast which once rehydrated will be reactivated and able to ferment the sugars that are in the wort as well as contribute to flavor and aroma production. This technology has been available in the market for brewing purposes since 1995 and has been greatly improved since then. ADY is known for having numerous advantages in the brewery and when you brew at home too. The long shelf life (preservation of yeast) is one of the major advantages of ADY. In addition, when considering brewing schedule there are several other advantages of ADY: e.g. more economical, no need for propagation or starter preparation, no need for quality management equipment, increased flexibility (see E2U™), reliability, consistent quality and time savings overall. ADY gives you the ability to be very dynamic in your strain diversification before and during the brew day. With direct pitching, you can split the batch in two, four, etc., and try several strains on the fly.

### What is E2U™?

Easy-to-use (E2U™) is a Fermentis brand used to char-

acterize specific wine and beer yeasts & fermentation solutions which can easily be used in the beverage manufacturing process, without going through complex preparation protocols that complicate the operation. E2U™ is an innovative concept to make your life easier, to save you time, and offer more comfort and safety. In fact, the extension of this brand to our beer range was recently communicated after a study conducted by Fermentis and independent laboratories in 2017. In the study, several trials were made to measure viability, various fermentation parameters (fermentation kinetics, final ethanol production, apparent degree of fermentation, etc.) and volatile compounds production in beers made; using different media (tap water, distilled water, 7°P, 15°P, 25°P wort), different temperatures (8°C/46°F, 12°C/54°F, 16°C/61°F, 20°C/68°F, 32°C/90°F, 40°C/104°F) and different kinds of agitation (without, moderate and violent) to rehydrate yeast, in comparison with direct pitching (moderate agitation at 30°C/86°F). No significant differences were found in this study for our full range of yeasts. You can see the example of the SafAle™ S-33 in Figure 4 on the next page. The study concluded that the performance of our brewing yeasts is not affected when they are rehydrated in different types of media (wort of different strengths, distilled water, tap water, etc.), at different speeds of agitation, and in a wide range of temperatures. Furthermore, it is not affected



Figure 3 - Logo E2U™ by Fermentis

when they are inoculated directly into the wort, without previous rehydration. The range is E2U™! You can now pitch directly, with no need to rehydrate; but if you still want to rehydrate, you can relax and use different conditions that adjust more to your process, without negative effects. But please... keep in mind that we are still talking about living microorganisms and there are some limits. Use the recommended temperature range for pitching (check the back of the sachet) and if you have always rehydrated Fermentis ADY, again, you can still do it, but do it preferably with hopped wort that will protect the yeast against microbial contamination. Last but not least, there is no need to oxygenate the wort when using E2U™ yeast by Fermentis (due to our production process) and **DO NOT** shake the flask extremely vigorously when you are rehydrating the yeasts. Our ADY are ready to go when you pitch them!

### What is the Best Before End Date (BBE) of E2U™ Fermentis ADY?

Best Before End Date for Fermentis yeasts is three years from production date which was established in 2016. Study results showed that in beers made with yeast exposed to forced aging tests, and almost 4 years of natural (true) aging, the performance and sensorial profile is not affected negatively, for either ale or lager strains. In addition, the temperatures of storage studied (-20°C/-4°F, 5°C/41°F, 25°C/77°F) do not affect the ale yeasts in any way, however there can be longer fermentation (2-3 days) for lager yeast that have been stored at ambient temperatures. So our recommendation would be to store lagers strains (SafLager™ W-34/70, SafLager™ S-189, SafLager™ S-23) at or below 10°C (50°F).

### Can I use E2U™ Fermentis ADY after multiple generations?

Yeast recycling is something you can do with E2U™ Fer-

mentis yeast, it is your decision. Keep in mind that yeast management requires laboratory equipment and knowledge to validate the quality of the cropped yeast as genetic drift can happen over time impacting several parameters in your beer, such as fermentation kinetics and volatile compounds produced. Our recommendation is to limit repitching to no more than 4-6 times (for any yeasts, not only Fermentis) and always check the quality of the cropped yeast. Again, the fact that you are using dry yeast does not mean you cannot recycle the culture. What is important is to check, when recycling yeast, the presence of beer spoilage microorganisms and that is something our E2U™ yeasts are controlled against from our yeasts bank and through the production process.

**What is the recommended pitch rate for E2U™ Fermentis ADY?**

Active Dry Yeast is dry yeast biomass with no free water molecules (94-97% dry matter). A pitch rate in weight per volume (grams per hectoliter) is the most accurate way, for ADY, to achieve consistency in your fermentations time after time. For E2U by Fermentis ale strains we

recommend a pitch rate of 50-80 gr/hL (2.06-3.3 oz/bbl); and 80-120 gr/hL (3.3-4.95 oz/bbl) for our lagers strains. In other words, one 11.5grs sachet (0.406 oz) is good for 5 gallons for ales and two 11.5g sachets for 5 gallons for lagers. For high gravity beers (over 18°P) it is better to pitch 2 sachets per 5 gallons brew.

For more information about our strains please check the website [www.fermentis.com](http://www.fermentis.com) or download the Fermentis App from the Apple Store or Google Play by scanning the QR code below. You can also download our Tips and Tricks for more detailed information of our strains from our web page.



INFLUENCE OF MEDIUM ON VITALITY

VITALITY – ALES: SAFALE S-33

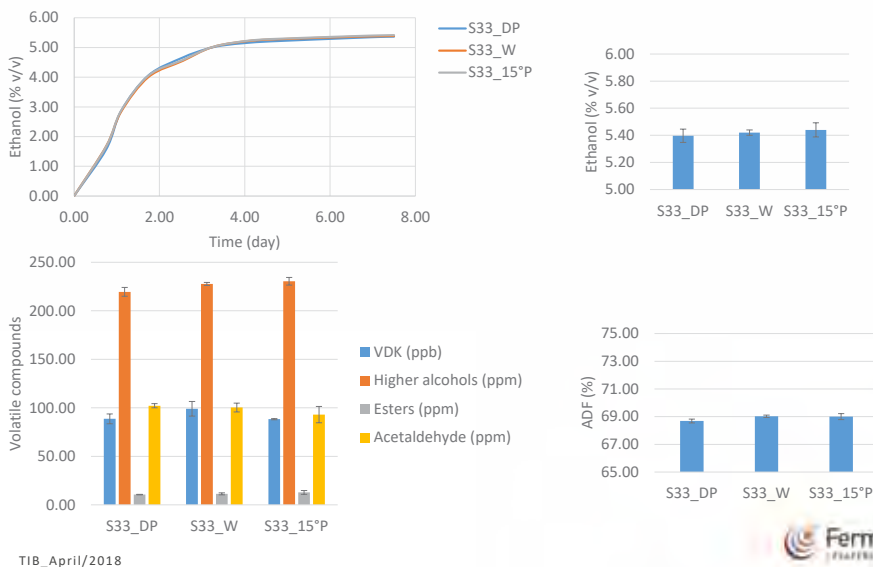


Figure 4 — Fermentation performance of SafAle™ S-33 (Pitching rate 50 g/hL, 15°P, 20°C) and the concentration of ethanol, residual sugars and volatiles (acetaldehyde, esters, higher alcohols and vicinal diketones) at the end of fermentation (before diacetyl rest) for 3 different rehydration procedures (in triplicate). DP: direct pitch without rehydration, W: rehydration in water at 30°C with moderate agitation, 15°P: rehydration in 15°P wort at 30°C with moderate agitation.



This article was written by the following Fermentis Team members: José Pizarro, the Technical Sales Manager for the home segment in North America, Kevin Lane, the Technical Sales Support Manager for the Americas, & Marcelo Cerdán, the Sales Director for the Americas.

We are very grateful for the contributions of our R&D Team, in particular by Philippe Janssens and Yves Gosselin from Fermentis in Lille, France. As well as our Marketing team: Hugo Picard, Stefanie Roedenbeck and our Head of Marketing Jeanne Gallerand. Contact us at: [fermentis.com/en/contact](http://fermentis.com/en/contact)



## TOO MUCH YEAST?

Also: Finishing strong, tricks to a hefe, and priming sugar uses

**Q** IT SEEMS LIKE I OFTEN HEAR ABOUT THE “DIRE” EFFECTS FROM UNDER-PITCHING YEAST, BUT CAN’T SAY I’VE HEARD MUCH ABOUT THE CONSEQUENCES OF OVER-PITCHING, BESIDES THE ADVICE OF: “DON’T DO IT.” WOULD LOVE TO HEAR WHAT PROBLEMS ARE ASSOCIATED WITH OVER-PITCHING YEAST, NOTABLY OVER-PITCHING WITH YEAST SLURRY?

JON K. RODRIGO  
MANILA, ARKANSAS

**A** Verbelen et al. (Impact of Pitching Rate on Yeast Fermentation Performance and Beer Flavour, *Applied Microbiology Biotechnology* (2009) 82:155–167) demonstrated that increasing pitching rates of lager yeast from 10 to 120 million cells/mL resulted in an increase in fermentation rate, decreased net biomass production when pitching exceeded 80 million cells/mL, higher post-fermentation levels of diacetyl, and minimal changes in overall beer flavor and yeast viability after fermentation. This group suggested that reduced cell production with higher pitching rates may present viability and vitality problems in subsequent fermentations because of a higher percentage of older cells in these yeast crops. A key takeaway from this study is that fermenter residency time for lager beers can be reduced by increasing pitching rate above 10 million cells/mL with minimal flavor differences in the finished beer.

Empirical observations with pitching rates less than 10 million cells/mL suggest that ester and higher alcohol levels increase as pitching rates decrease and total cell growth increases. Restricting pitching rates when brewing certain beer styles, such as hefeweizen, is one method used to increase fermentation-related aroma compounds. One downside of increasing yeast density for certain styles of beers may be reduced ester production.

In practice, high pitching rates can be difficult to achieve when growing liquid yeast for first generation use because high pitching rates require a relatively high percentage of yeast pitch. Many brewers, especially homebrewers, grow yeast in wort that is different from the beer being brewed. And most brewers pitch the entire slurry of propagated yeast. This means that higher pitching rates will likely dilute the wort brewed for a particular beer with propagation wort. This dilemma is easily addressed by homebrewers and smaller commercial breweries by using dry yeast.

Dried yeast use is not as common in larger commercial breweries because of the cost of dried yeast in comparison to yeast produced in propagation system. There are also general concerns about re-pitching yeast crops from fermentations started from dried yeast, making liquid starts the most common in larger commercial operations. These brewers can concentrate cell density by allowing propagated yeast to sediment or they can increase cell density using a centrifuge. I am not aware that either of these methods is commonly used by commercial breweries to concentrate cell density following propagation. However, pitching high-density yeast slurry harvested from a fermenter is common and allows brewers to increase pitching rates without excessive wort dilution (harvested slurry typically

One downside of increasing yeast density for certain styles of beers may be reduced ester production.



Photo by Ed Kraus

# HELP ME, MR. WIZARD

contains approximately 1 billion cells/mL compared to slurry from a propagation system with approximately 100-150 million cells/mL).

Aside from better equipment utilization, another practical benefit to increasing yeast pitching rates is faster net uptake of wort nutrients by yeast, faster pH reduction, and a faster increase in ethanol concentration. All of these changes reduce the chances of beer spoilage related to wild yeast and bacteria.

**Q** I HAVE A FERMENTATION ISSUE WITH A NEW ENGLAND IPA I JUST BREWED. IT'S BEEN IN THE FERMENTER AT ~65 °F (18 °C) FOR 22 DAYS AND IT IS TAKING LONGER TO FINISH FERMENTING THAN USUAL. BY NOW IT SHOULD HAVE BEEN FINISHING FERMENTATION BELOW 1.020, BUT I HAVE TWO FERMENTERS OVER 1.020 (1.022 AND 1.024); THE OTHER ONE IS 1.018 (I BREW 50-L/13 GAL. BATCHES AND SPLIT THEM INTO (3) 5-GALLON (19-L) FERMENTERS).

THIS TIME I MADE A 3-L (3-QT.) STARTER WITH ONE VIAL OF WHITE LABS WLP008 (EAST COAST ALE). TWO DAYS AGO, I USED ANOTHER WLP008 VIAL AND ADDED A THIRD OF THE VIAL IN EACH FERMENTER. I SEE ACTIVITY FROM THE AIRLOCK BUT IT IS TAKING A LOT OF TIME. MY INQUIRY HERE IS WHAT I SHOULD DO NEXT? SHOULD I ADD ANOTHER WLP008 VIAL? THE FINAL GRAVITY SHOULD BE AROUND 1.012-1.015.

I HAVE TWO DIFFERENT HYDROMETERS, SO I TRUST THE MEASUREMENTS. I MASHED A BLEND OF PALE MALT, MALTED OATS, WHITE WHEAT MALT, AND VIENNA MALT AT 151 °F (66 °C) FOR AN HOUR. THE STARTING GRAVITY WAS 1.061.

ROBERTO CABALLERO  
LIMA, PERÚ

**A** Whenever there seems to be an attenuation problem with a batch, I think it always helps to go through a mental check list of the basics. This checklist of mine includes the following:

- ✓ Mashing issues?
- ✓ Yeast nutrients and/or zinc added to the wort?
- ✓ Yeast into wort cooled to the correct temperature?
- ✓ Wort aerated normally?
- ✓ Sufficient yeast added to the fermenter?
- ✓ Anything unusual that may have caused an early end to fermentation?
- ✓ Yeast strain known for lagging fermentation?
- ✓ Final gravity known?

I am going to run this list to illustrate a point about mental checklists, so bear with me while I talk to myself!

Mash OK? It looks normal. 151 °F (66 °C) for an hour puts the mash right in the middle of the peaks for beta and alpha amylase. All malts had good enzyme levels (nothing really high kilned) and the adjunct ratio looks OK.

Nutrients added? Hmm, I typically don't worry too much about FAN (free amino nitrogen) or phosphorous with all-malt worts, so did not add nutrients to this batch. Should consider this topic more for the next brew. I did add zinc to the wort (0.20 mg/liter). I am not thinking that nutrients are the issue.

Wort temperature OK? Wort was cooled to 61 °F (16 °C), pitched with yeast from my propagation at 65 °F (18 °C), and the fermentation was allowed to free-rise up to whatever temperature was in the fermenters with a room temperature of 65 °F (18 °C). Not sure what the actual fermenter tem-

In answer to your basic question, there are no major, stop-the-press, problems associated with increasing yeast pitching rates. Most practical brewers are conservative when it comes to changing brewing methods. If you want to experiment with upping your pitching rate, consider moderate increases over time to determine how these changes affect finished beer quality and harvested yeast health. In my book, slow and steady wins the race!

perature was, but probably not too cool or too warm.

Wort aeration? This batch was aerated normally, but I really don't know much about how much oxygen is in my wort. I used oxygen and a stone, and gave each fermenter a 90-second blast after filling. Should probably spend some time thinking about this a bit more.

Yeast pitching rate? A good rule is to multiply the propagation volume by 8-15 to determine how much wort can be pitched. Lagers are toward the 8x end of the range and ales towards the 15x end. Three liters x 15 = 45 liters of wort. This batch was 50 liters; maybe a bit on the low side but probably not too low. No microscope... how can I ball park the pitch rate? I have read that propagated yeast that is aerated through a cotton plug in the top of a stirred flask (magnetic bar and stir plate method) normally provides 100 million cells/mL ( $1 \times 10^8$  cells per mL or  $1 \times 10^{11}$  cells/liter). This works out to 3 liters x  $1 \times 10^{11}$  cells/liter ÷ 50 liters =  $6 \times 10^9$  cells/liter =  $6 \times 10^6$  cells/mL = 6 million cells/mL. Pitching rate looks good. Note to self: Brush up on using scientific notation.

Fermentation normal? Nothing odd. Room temperature constant during fermentation, and no big weather swings.

Strain particulars? White Labs website indicates this strain works best between 68-73 °F (20-23 °C) range and usually attenuates beer in the 70-75% range. The original gravity (OG) was 1.061, so the expected FG is in the 1.015 to 1.018 range based on attenuation range from the web. Could lower fermentation temperature be causing issues?

Known final gravity (FG)? According to what I just calculated the FG should be in the 1.015-1.018 range and the recipe is telling me 1.012-1.018. That's a little funky.

I don't know how most people go about troubleshooting,



but the linear approach above is how I go about thinking through brewing problems. These items from above stand out: Enzyme dilution, wort aeration, fermentation temperature, and the target final gravity.

When adjuncts like flaked oats are used, it is important to think about enzyme dilution. Most New England IPAs contain about 30% adjunct (calculated as portion of total wort extract), use North American 2-row base malt, sometimes contain malted wheat, and may contain a splash of higher kilned pale malt as a flavor boost. Calculating blended diastatic power (DP) and dextrinizing units (DU) is easy if malt analyses are available. This question does not have enough information to calculate a weighted average for DP and DU, but a good rule of thumb for North American malt is that adjunct ratios up to about 25% are no problem at all. If a good dose of wheat malt in the 10–20% range is used, bumping the adjunct ratio up to 30% rarely causes a problem because wheat malt is usually more enzymatic than barley malt. One problem that flaked adjuncts can cause is starch extraction after mash-off because not all flakes easily yield their extract. For this reason, a cautious method is to skip mash-off and delay kettle heating until the kettle is about 80% full. Both of these steps extend the brew day, but starchy wort is one cause of reduced fermentability.

Wort aeration is a topic that interests me as a practical brewer because it has a very real influence on yeast growth,

fermentation rate, and beer flavor, but is rarely measured by the majority of brewers because dissolved oxygen meters (DO) are relatively expensive and measuring DO in wort is not required if aeration or oxygenation is consistently performed. This is pretty easy to do when a controlled volume of tiny air or oxygen bubbles is added to cool wort. And the easiest way to measure gas flow rate is with a rotameter. Although these gadgets are easy to find and are not expensive, few homebrewers measure air or oxygen flow and, instead, rely on time. Flow rate through a stone can easily change as a stone becomes fouled with protein and hop resins, making control by time approximate. High finish gravities can definitely be related to wort aeration.

Fermentation temperature is a red herring for most fermentations because cool fermentation temperatures typically do not result in high final gravities, they just slow the rate of fermentation. Most ale strains have no problem fermenting in the 61–64 °F (16–18 °C) range, especially when a healthy pitch rate is added to well-aerated wort.

Target final gravity is the last item on my list of possible problems, and is really the problem I most suspect. Recipes and yeast profiles provide little more than an educated guess about the final gravity of the batch of beer a brewer brews using another brewer's recipe with a yeast purchased from any number of reputable sources because the final gravity is a function of wort carbohydrate spectrum coupled with yeast strain. Even when the same beer is brewed in the

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same system, variations in the FG are not uncommon. Wort carbohydrate spectrum is influenced by grist bill and the specific characteristics of the grains used, malt milling, brewing water chemistry, mash time and temperature, sparge temperature, and wort temperature in the kettle during wort collection. There are definitely lots of things that can influence wort fermentability from a single recipe.

The only way to know the true target FG is to perform a forced-fermentation test where an excess of the fermenting strain of yeast is added to a sample of wort from the brew in question, and the fermentation accelerated in a stirred flask. The American Society of Brewing Chemists (ASBC) forced fermentation method specifies adding 1 gram of compressed yeast to 250 mL of wort and allowing the fermentation to complete, as determined by consistent gravity readings measured over a 3-hour (minimum) time period. Many commercial breweries, especially those that

bottle condition, perform forced fermentations on every single batch.

You suggested in your question that adding more yeast may help. This is a very helpful method when you know for certain that your fermentation has not finished. I think kraüsening is the best way to add yeast to a stuck fermentation because adding yeast at high kraüsen helps ensure that the yeast will quickly finish the fermentation, mop up acetaldehyde and diacetyl, and be done. Simply adding more liquid yeast that is not metabolically up and running will not have the same effect as adding yeast in high kraüsen.

Diagnosing problems on paper is difficult, but my bet is that you have a combination of factors leading to a higher-than-expected FG, coupled with perhaps inconsistent wort aeration, that has resulted in three fermenters of wort from the same batch ending at different gravities. If that is the case, kraüsening should be considered.

**Q** MY FAVORITE BEER IS A BANANA-FORWARD, SLIGHTLY SWEET GERMAN HEFEWEIZEN (FRANZISKANER/PAULANER). I'VE TRIED BREWING THIS STYLE THREE TIMES AND EVERY TIME MY BEER HAS COME OUT BLAND AND FLAVORLESS. I'VE TRIED ALL THE TRICKS, OPEN FERMENTATION, NO OXYGEN, NO STARTER, USING WYEAST 3068, AND MASHING AT 152 °F (67 °C). SHOULD I TRY A HIGHER MASH TEMPERATURE TO GET MORE BODY AND MORE FLAVOR? I SIMPLY CAN'T GET THIS ONE RIGHT. HELP!

TRAVIS  
VIA *BYO* LIVE CHAT

**A** German-style hefeweizen is one of my favorite styles of beer, and is a beer type that I feel pretty darn comfortable brewing, with two Great American Beer Festival medals in 2006 (gold) and 2008 (bronze) to boot. I tend to avoid style and recipe questions for this column, but this great style is one that many brewers seem to struggle with brewing. I am hoping that my tips help you.

The first bit of advice I have to offer is to keep recipes simple. Most hefeweizens have a grist bill that are about 40–50% malted barley and 50–60% malted wheat. I like adding about 2% dark crystal malt for a little color and just a small kiss of crystal sweetness. I am a fan of reverse osmosis (RO) water and target 100 ppm calcium in the brewing water from a blend of calcium chloride and gypsum. German hops are my go-to for this style and I like using two additions during the boil and a very small addition at flame-out for just a hint of hop nose. Bitterness is low at 12–15 IBU.

I do not believe there are any tricks or secrets to brewing a good hefeweizen, but there are a couple of techniques that I feel are very important. And the most important technique to me occurs at the very beginning of the brew day with a mash rest around 113–126 °F (45–52 °C). This temperature range allows for cytase activity and an increase in ferulic acid levels in the wort. Weizen yeast are so-called POF+ (phenolic off-flavor positive) because they have an enzyme system that converts ferulic acid to 4-vinyl-guaiacol during fermentation, imparting a clove-like aroma to the beer. My favorite weizens have a nice balance of clove and banana and this low temperature mash rest is a great way to ensure a nice punch of clove. Rests at 140 °F (60 °C) and 158 °F

(70 °C) follow, with mash-out at 168 °F (76 °C) before starting wort collection.

The next critical step is preparing for fermentation. I have never tried starving weizen wort of oxygen or pitching at a very low rate, and have had success using typical aeration levels and pitching rates. I am picky about yeast strain selection and strongly suggest changing strains if you are not getting the aroma profile you like from Wyeast 3068; this is one of many nice weizen beer strains, and is definitely not the common factor of all great weizens. Since I like a nice clove profile in my weizen, strains that lean a little more towards the phenolic end of the spectrum are more my speed than the big banana bombers. A great way to select a strain is to brew a batch and split it 4–5 ways so you can trial 4–5 yeast strains. Find the yeast strain that is going to give you the aromas that ring your bell.

I suggest fermenting in the 64–70 °F (18–20 °C) range, allowing for a couple days for a diacetyl rest and cold crashing before bottling or kegging. Most weizen strains are true top-croppers, meaning that the yeast rises to the top of the fermenter where it can either be skimmed for re-use or the beer can be racked from beneath the yeast before cold crashing; the yeast that ends up on the bottom of the fermenter can then be collected and reused. Weizen yeast that is harvested in this manner can be used for many generations as long as it is not stored long between brews. Although carbonation level for this style is not likely to move the needle for thin, blah brews, tasty weizens certainly benefit from above average carbonation levels and proper weizen glassware. Prost!



**Q** I JUST BOUGHT SOME ALL-GRAIN KITS WITH THE PRIMING SUGAR INCLUDED. I KEG AND FORCE CARBONATE SO I NOW HAVE A BOX FULL OF PRIMING SUGAR PACKETS. I JUST THOUGHT, WHY NOT ADD THE SUGAR DURING THE BOIL. ANY DRAWBACKS TO THIS PLAN?


RUDY BROOKS  
JUNCTION CITY, KANSAS

**A** Rudy, I like your ideas! This question reminds me of lyrics from The Clash tune "Rudi Can't Fail."

*Now we get a rude and a reckless  
We been seen lookin' cool an' speckless  
We been drinking brew for breakfast  
Rudie can't fail*

Not saying you have been drinking beer with breakfast, but the idea of saving up priming sugar bags from kits you have brewed does seem like the sort of idea that could come from pre-brew day planning! So, is this idea fraught for failure? Certainly not.

Simple sugars are a useful brewing adjunct when you are looking for a gravity boost to simply boost strength or to turn down that flavor dial a tick. No matter what may be said about this agenda, many brewers are not squeamish about adding sugar to wort to enhance beer flavor. That's right, enhance flavor. Adding simple sugars to a moderately high gravity wort can help develop aromas and flavors in beer, help to balance malt fullness in the finish of a beer, and can bump the alcohol content without drawing unwanted attention. And you can also use simple sugars to reduce beer color, and to reduce wort FAN, and protein levels.

Styles that you may want to brew using your booty of priming sugar include British-style pale ales, West Coast-style IPAs, Belgian-style tripel, North American-style lagers, and Tropical-style stouts. And if you want to work on a GABF Pro-Am recipe for something called "Rudy Can't Fale," the name is yours for the taking! 



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# STYLE PROFILE

BY GORDON STRONG

## RAUCHBIER

Smoke 'em if you got 'em

Some very localized brewing regions developed their own beer styles featuring smoked malt of some sort.

### RAUCHBIER BY THE NUMBERS

|            |             |
|------------|-------------|
| OG: .....  | 1.050–1.057 |
| FG: .....  | 1.012–1.016 |
| SRM: ..... | 12–22       |
| IBU: ..... | 20–30       |
| ABV: ..... | 4.8–6.0%    |



Photo by Charles A. Parker/Images Plus

I used to drink much more smoked beer but I kind of lost a taste for them after a serious house fire in 2014. It's kind of hard to enjoy a beer when it reminds you of burning house. But now that some time has passed, I'm finding myself missing the classic smoked Märzen-style lagers of Bamberg, the German rauchbier. Time to ease myself back into the saddle, it seems.

The 2015 Beer Judge Certification Program (BJCP) Style Guidelines groups rauchbier in Category 6 (Amber Malt European Lager) along with Märzen and dunkles bock. Rauchbier is style 6B in the guidelines. This grouping is not without controversy since in the 2008 BJCP Style Guidelines, rauchbier was grouped with smoked beers. However, in the 2015 guidelines, the decision was made to reserve the smoked-beer category (Category 32) for specialty-type beers.

Grouping rauchbier with other amber lagers was based on the profile of the base beer and the well-established nature of the style. Yes, smoked beers can dominate the palate when compared against the other beers, but judges should save them for the last beers in the flight. We wanted to emphasize the base style of the beer (Märzen) more than the smoked nature of the beer, so we let the experimental-type beers be grouped together in the smoked-beer category.

### HISTORY

At one point in time, all beers were smoked since malt was dried over fires using a variety of fuel source (wood or straw, typically). The smoke clung to the husks of the malt and survived the brewing process to be part of the final character of the beer.

Coal was considered undesirable for drying malt due to the impurities, however, the purified form of coal (coke) was acceptable. The use of indirect-fired kilns made the fuel source somewhat

moot, but during the 1700s, the smoky character of most beers was eliminated.

The invention of the drum roaster in the early 1800s allowed the production of darker malts, notably black patent malt. This allowed beers to have a darker color without using the traditional brown malts that had a smoky character. It also somewhat substituted a related roasted or burnt flavor for the classic smoke character.

Some very localized brewing regions developed their own beer styles featuring smoked malt of some sort. Grodziskie (Grätzer) from modern Poland is made from oak-smoked wheat malt, for instance. Lichtenhainer was a historical sour wheat beer from central Germany that used smoked barley malt in its production; it was popular in the late 1800s. Alaskan Brewing Company in modern times has made an alder-smoked porter. There are many other examples of individual beer styles with a smoky character.

The Franconia region of northern Bavaria in the southern part of Germany is one of the most densely populated brewery regions of the world. Breweries within the city of Bamberg in Franconia have produced several types of smoked beer, but the most famous one is the smoked-amber lager known as rauchbier (smoke beer). It is basically a beechwood-smoked Märzen, which is the historical type of beer that was traditionally served at Oktoberfest celebrations until the 1990s, but that survives as the export version of Oktoberfest that is commonly found in the United States.

The development of the actual rauchbier style is poorly documented, so I don't want to make the claim that this style has come down unchanged since the days when smoked malts were common. That claim would be absurd since the base Märzen style traces back to the mid-1800s, by which time smoke was removed from most beer styles.



Some breweries in Bamberg (such as Schlenkerla) produce their own smoked malt, but Weyermann Malts of Bamberg produces the best known beechwood-smoked Vienna-style malt, known simply as rauchmalz (smoked malt). Bestmalz in Heidelberg, Germany also produces a smoked malt using beechwood from Franconia.

## SENSORY PROFILE

The two most important sensory features of a rauchbier is that it has beechwood-smoke character and is a malty-amber lager. The color is a bit more variable than the underlying Märzen style, with some versions being coppery-brown (the iconic Schlenkerla commercial version is quite dark, but it is somewhat of an outlier stylistically with regards to color). The head can be tinted a little darker than a Märzen as well, with a cream to tan color. The beer should be very clear.

The character of the smoke is important, mostly in that it should have a refined character and not be acrid, greasy, creosote-like, or harsh. As much as it can be described this way, the smoke should have a clean character – it should be smoky or woody, perhaps reminiscent of bacon or other desirable smoked products but not sulfury, rubbery, or phenolic. The smoke should be apparent in the aroma and flavor, but the intensity of the smoke is quite variable and up to the brewer's discretion. Judges should not penalize a rauchbier for not being a smoke bomb – balance and drinkability are vital.

The remaining aspects of the beer are similar to a Märzen; malty-rich with a toasty character and restrained bitterness in the balance. The malty-yet-dry finish encourages another drink, as with the best German lagers. The malt profile should be richly malty but not really sweet, and the toasty aspects should not veer into the roasted or burnt world since this tends to make the smoke character seem less clean and also isn't really right for the base style.

The bitterness level should be enough to prevent the malt from seeming sweet, but while still allowing the maltiness to be primary in the balance. Late hops are low, and tend to have a

## RAUCHBIER

(5 gallons/19 L, all-grain)  
OG = 1.053 FG = 1.013  
IBU = 21 SRM = 16 ABV = 5.3%



### INGREDIENTS

6 lbs. (2.7 kg) German smoked malt (rauchmalz)  
3 lbs. (1.4 kg) Munich malt (6 °L)  
1 lb. (454 g) dark Munich malt (9 °L)  
8 oz. (227 g) aromatic malt  
8 oz. (227 g) Caramunich® III malt (57 °L)  
2 oz. (57 g) Carafa® Special III malt (525 °L)  
5.3 AAU Hallertauer hops (60 min.) (1.5 oz./43 g at 3.5% alpha acid)  
0.5 oz. (14 g) Hallertauer hops (5 min.)  
White Labs WLP830 (German Lager), Wyeast 2124 (Bohemian Lager), or Fermentis SafLager W-34/70 yeast  
 $\frac{3}{4}$  cup corn sugar (if priming)

### STEP BY STEP

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

Step mash the rauchmalz, Munich, dark Munich, and aromatic malts at 131 °F (55 °C) for 10 minutes. Raise mash temperature to 146 °F (63 °C) and hold for 40 minutes, then up to 158 °F (70 °C) for 20 minutes. Start recirculating wort. Add remaining malts and raise the temperature to 168 °F (76 °C) and hold for 15 minutes. Sparge slowly and collect 6.5 gallons (24.5 L) of wort.

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

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

Rack the beer, prime and bottle condition, or keg and force carbonate to 2.4 volumes.

## RAUCHBIER

(5 gallons/19 L, partial mash)  
OG = 1.053 FG = 1.013  
IBU = 21 SRM = 14 ABV = 5.3%



### INGREDIENTS

6 lbs. (2.7 kg) German smoked malt (rauchmalz)  
3 lbs. (1.4 kg) Munich liquid malt extract  
8 oz. (227 g) Caramunich® III malt (57 °L)  
2 oz. (57 g) Carafa® Special III malt (525 °L)  
5.3 AAU Hallertauer hops (60 min.) (1.5 oz./43 g at 3.5% alpha acid)  
0.5 oz. (14 g) Hallertauer hops (5 min.)  
White Labs WLP830 (German Lager), Wyeast 2124 (Bohemian Lager), or Fermentis SafLager W-34/70 yeast  
 $\frac{3}{4}$  cup corn sugar (if priming)

### STEP BY STEP

This recipe utilizes a partial mash of the rauchmalz. Mash the crushed smoked malt in 9 quarts (8.5 L) of water at 151 °F (66 °C) for 45 minutes. Sparge with 9 qts. (8.5 L) of water and top off with water in order to have 6 gallons (23 L) of wort in the kettle.

Steep the dark malts (Caramunich® and Carafa® Special) for 30 minutes. Remove and rinse with hot water. Be sure that the the heat is turned off, then add the malt extract and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil.

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

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

Rack the beer, prime and bottle condition, or keg and force carbonate to 2.4 volumes.





## STYLE PROFILE

typical German noble hop profile – floral, spicy, and/or herbal. The hop flavor and aroma should not really stand out, and should be supportive of the malt and smoke. It is certainly acceptable to not have any late hop character evident, depending on the level of perceptible smoke.

The body should not be too heavy – medium is a typical level. Carbonation is moderate as well. Drinkability is important as in all German lagers, so the smooth lager character without harsh astringency is critical. Fermentation byproducts such as buttery diacetyl, fruity esters, and green apple or latex paint-like acetaldehyde should not be present. A clean fermentation character and smooth lager profile are characteristic of the style.

The beer is average strength, roughly 5 to 6% alcohol by

sweetness. Final color adjustment through the use of darker CaraMunich-type malts is typical, although the huskless varieties should be used to avoid introducing overly burnt flavors.

The best-known German examples (Schlenkerla and Spezial) use double-decoction mashes, which tend to emphasize the malty character of the beer while also increasing color. Step mashes are also a traditional technique that can be used, although recipes using step mashes probably should have a higher percentage of Munich-type malts to compensate for the reduced Maillard reactions in the mash.

More intensive mash programs like I mentioned help with developing the right level of fermentability of the wort while retaining sufficient dextrins to give the beer a pleasant body. This fermentability allows the yeast to properly



**Rauchmalz is a required ingredient for the style, and can be used in varying quantities up to 100% of the grist.**



attenuate the beer so that it isn't thick or syrupy sweet. I think that's the hallmark of good German beer, that it can be dry while not being thin or watery. Otherwise, you wouldn't be able to drink it a liter at a time ...

volume. Stronger versions exist, but those are more like bock beers than Märzen types. I think lower alcohol versions are enjoyable, but aren't really traditional as these are based on fest-type beers, which are at the higher end of the normal strength range for beer.

The aftertaste should carry through the dominant flavors of smoke and rich malt, but should have a pleasant dryness. These beers are not crisp like a Pilsner, so the flavor should linger a bit longer on the palate. The balance of flavors should provide some interest to the drinker, where savoring the flavor is encouraged. The malty flavors tend to take the edge off the smoke impression so that the beer can be enjoyed in quantity.

### BREWING INGREDIENTS AND METHODS

Rauchmalz is a required ingredient for the style, and can be used in varying quantities up to 100% of the grist. It is basically a Vienna-style malt, so a first step in developing a rauchbier recipe is often adapting an existing Märzen recipe by swapping rauchmalz for the Vienna and Pilsner malts. Depending on the freshness and age of the malt, the smoke intensity can be quite strong so those who prefer a lighter smoke character may want to use the lower end of the range, perhaps 20% of the grist.

There are other types of smoked malt available, such as the oak-smoked wheat malt used in Grodziskie, cherry-smoked barley malt, and peat-smoked distiller's malt. Avoid using these and other types of smoked malt in this style of beer as the smoke character will not be typical for the style.

Additional maltiness is needed in the style to support the smoke character, so more malty base grains like Munich, dark Munich, and aromatic malts can be used. The beer shouldn't be overly sweet, so caramel-type malts are generally to be avoided although some darker CaraMunich is often used for color adjustment and to provide a light

German or Czech noble hops are common in German lagers, and this style is no exception. Hallertauer, Tettnanger, or Saaz would be fine choices, as would the US-grown equivalents (Santiam, Liberty, Crystal, Mt. Hood, Vanguard, Ultra, Sterling). Most of the hop usage should be as a bittering addition, with only a token amount used for flavor or aroma, if at all. The hops selected should not interfere with the malt and smoke profile.

Normally I don't say much about water, but I would like to make one point. Smoke is a phenol, so extra care should be taken about chlorine in your water. Chlorine and phenols combine to create chlorophenolic compounds, which are very strong and medicinal. They do not go away, and can ruin your beer. So take care to use chlorine-free water, either by charcoal-filtering your municipal water supply, using natural spring water, or to use some form of deionized water such as reverse osmosis water. While you're at it, avoiding sulfur compounds in the water would be helpful, so if you add any water salts, limit yourself to calcium chloride. Sulfur and smoke isn't a desirable combination, as it reminds you of burnt matches.

A clean German lager yeast is traditional. I personally like the Weihenstephan W34/70 lager strain, but any yeast that doesn't throw much sulfur and favors malty styles is desirable. This is a widely used yeast strain that is available from multiple suppliers. The German Bock strain associated with Ayinger (White Labs WLP833) is another good choice since it makes a very malty beer. A normal German fermentation regimen followed by sufficient lagering is appropriate – nothing special here. Ferment around 50 °F (10 °C) until complete and lager at near-freezing temperatures for at least four to six weeks.


## HOMEBREW EXAMPLE

My recipe is targeting a balanced level of smoke, with a little more than half the grist being rauchmalz (I tend to use Weyermann). I'm using a step mash in this recipe, so it should be easier to produce than using a double decoction. The rest of my grist is very similar to what I use for a Märzen, with the addition of a bit of Carafa® III Special to darken the color a bit. I'm not looking to go very dark, but I would like a bit of a reddish copper hue to be apparent.

I'm using multiple malt flavor boosting choices in the grist to help support the smoke without getting sweet. While Munich malt is fairly common, I like adding dark Munich (like Weyermann Munich II) and aromatic malts to increase the malt intensity and get the deeper malt flavors that are often elusive for homebrewers looking to produce the richness found in commercial German beers.

I'm shooting for a beer at the low end of the style in bitterness and gravity since I'm not trying to go huge on the smoke character. I think they tend to scale with each other to preserve the balance the style requires. Using classic German hops is an obvious move, as is keeping the late hopping very light. Again, very much like a classic Märzen.

A classic German yeast selection, fermentation, and lagering program complete the recipe. While I have quoted specific times, you should really let fermentation run until complete, and then let lagering proceed until the beer drops clear and is smooth on your palate. I find that keeping lagering as close to freezing as possible lets the process go faster and will produce better results.

This is a more balanced and restrained version of the style, which is something that I would like to drink. If I was planning the beer for competition, I might develop a different recipe that was a bit stronger and used a higher percentage of rauchmalz in the grist. Beers that taste good while judging an ounce or two at a time aren't always the same ones that taste good a pint at a time. Since smoke can build on your palate, I'm acting with some self-imposed restraint. 



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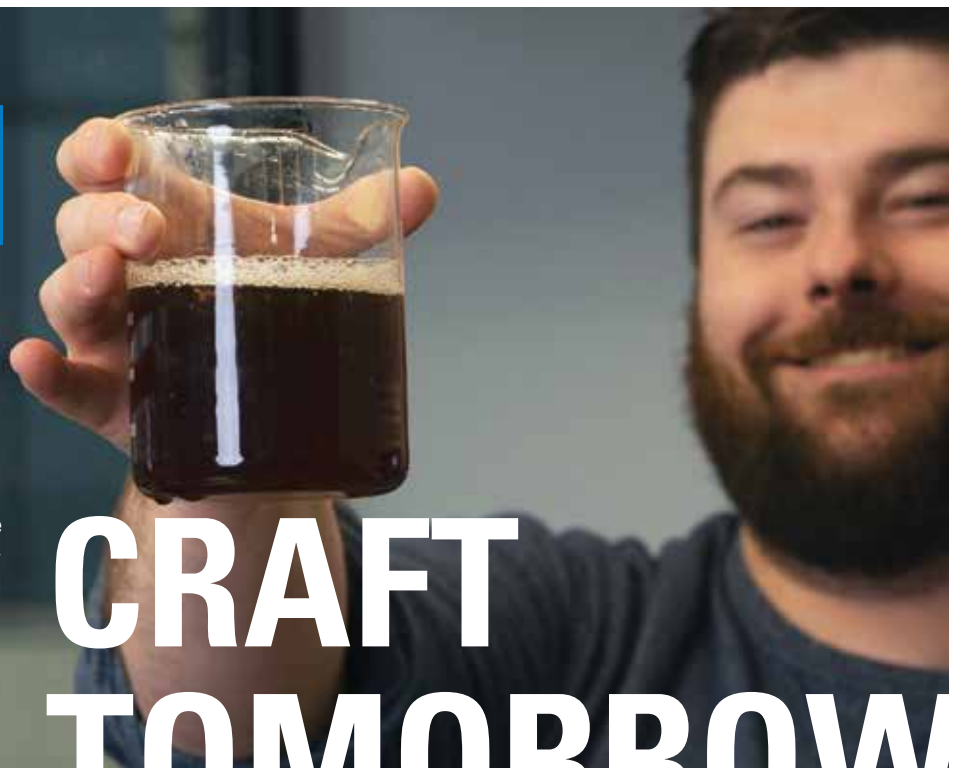
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# BREWING WITH COFFEE

## Methods For Concocting Coffee Beers

by Jason Simmons

One thing that you will find in common among professional brewers is that we usually drink more coffee throughout our day than we do beer. Some of us just need a caffeine fix to get us started on the right track for the day, while others are more connoisseurs in the coffee world. When it came time to design and make a coffee beer for the brewery I work at, I soon realized that coffee, as an ingredient, is no different than any other ingredient that you might put into your beer. It is an agricultural product that needs some attention

to detail to hit your flavor targets. When making a recipe for a coffee beer of any style, the coffee addition should be made to showcase the coffee character while being supported by the base beer style. What may work for one recipe might not work for the same exact recipe when only changing the coffee variety or roasting level. By understanding coffee and all of its properties, a brewer can make the best decisions to brew a well-balanced beer that will showcase your coffee selection in your finished beer.





Photos by Shutterstock.com



## BASE BEER STYLE

When we decide to make a coffee beer, we usually have a style of beer in mind that we would like to brew. The majority of the time it is a darker style beer such as a porter or stout, however do not let this discourage you from trying other styles. A coffee cream ale, lager, or even an IPA can taste just as delicious as any coffee porter or stout. Being able to successfully brew the base recipe with all of its minor variables (such as water profile, pH, fermentation, packaging, and other brewing processes) will help you build an excellent base for your coffee beer. Not all styles of beer are brewed in the same fashion or within the capabilities of all homebrewers. By picking a style that you are comfortable brewing and know much about will help you better formulate a recipe that will produce a perfect beer using what is available to you.

Remember, when making a coffee beer you want to showcase the coffee and roast level that is supported by this base beer style. Some brewers may think that brewing a beer with coffee in it is as simple as throwing a pot of coffee into a brew just before packaging. While this could produce a good beer, it likely will not produce a great beer. Knowing the base style and

how to properly brew it along with the knowledge of coffee variety, roast, and most importantly how to apply it to your brewing practice will give you the best results.

## COFFEE

Coffee is a topic that we could go into great detail exploring every aspect of. It is just as in-depth as malting, growing hops, or any other aspect that goes into making a great beer. Being an agricultural product, the character of each coffee is dependent on the location, climate (which includes temperature and precipitation), soil composition, elevation, variety, and methods used to grow the coffee. These slight variations in variables will produce a noticeably different product, and because of this there is a high demand for select coffees.

As your average coffee drinker who never thought too much about coffee before using it in a beer, I got overwhelmed by the crash course I received on coffee. However, I will try to keep things simpler here. If you want more details there are entire books about the subject.

When you showcase coffee in your beer you are trying to incorporate as much of the coffee bean flavor without adding any harsh, unwanted at-

tributes. Because coffee is a roasted product, acidity and balance is usually the main focus with coffee beers followed by flavor and aroma.

Where the coffee is grown has more effect on flavor than the specific variety. This is why we usually see the location instead of the variety in the name of the coffee when we buy it. There are a wide range of flavors that coffee can provide such as nutty, fruity, earthy, sweet, chocolaty, and herbal, to name a few.

Colombian varieties tend to be more sweet and less acidic than other varieties with some nutty notes. Brazilian coffee has a more chocolaty and creamier profile with an aftertaste that is not as clean as some Colombian varieties. African coffees, such as Ethiopian, are usually described as complex, fruity, and floral, and provide richer, full-bodied aromas and flavors. Asian coffees, like the famous Sumatra or Java varieties, tend to provide unique characteristics that can be more of an acquired taste. They are earthier, more complex, and darker than most other coffees, yet have a low acidity making them great for using in beer production.

Any coffee variety and roast level will work in a coffee beer — it just depends on what type of flavors, char-



*The roast level and terroir of where it was grown will have a significant impact on the coffee beans and character they impart on the beer.*



*Cold-brewing coffee can lead to a smoother coffee roast character with less harsh and acidic flavors associated with hot-brewed coffee.*

acter, and intensity you want in your recipe. When looking for the right characteristics for your beer, you can either find what brand of coffee you enjoy the most, or you can visit your local coffee shop to experience some more detailed selections. If you call ahead or visit the coffee shop during slow business hours the staff are usually more than happy to take the time to explain coffee, their processes, and any suggestions of their products to better fit the profile you are seeking in your recipe.

### **HOW AND WHEN TO ADD THE COFFEE**

In the world of homebrewing everything is possible, and everyone has their favorite methods with stories to tell on every topic. I, too, am no different. I have heard of everything ranging from adding the coffee into the mash, during sparging, all the way to adding it to a keg or cask. Some of the popular methods out there that I have heard of or done myself include: Adding a cheesecloth full of coffee (ground fine, ground coarse, or whole beans) near the end of boil until flameout, whirlpool additions, “dry bean” additions in the fermenter (fine, coarse, or whole beans, with and without cheesecloth bags), hot-brewed coffee added to the packaging vessel, cold-brewed coffee (soaked in water or beer) added to the packaging

vessel, or just placing a cheesecloth bag with coffee beans (ground fine, coarse, or whole beans) inside a keg.

### **WHOLE BEAN VS GROUND**

I prefer using whole coffee beans over ground beans, coarse or fine. Roasted coffee beans are brittle and easier to handle and weigh when using whole beans, plus it helps keep the process consistent. Ground coffee beans will no doubt create a mess and have potential to clog up any equipment or filters. After a few batches using ground coffee I switched to whole beans and never went back. I personally have found no major flavor difference between using whole beans or ground coffee, however it is commonly stated that a finer grind will produce more intense characters than using a coarser grind or whole beans.

### **HOT-SIDE ADDITIONS**

I do enjoy the simplicity of brewing up a strong pot of coffee and just pouring it into a keg or bottling bucket before packaging. This method has produced very acceptable beers in my experience, however it can also provide negative attributes to a finished beer. Using hot brewed coffee can easily extract acids, oils, tannins, as well as astringency from the coffee beans. Along with these undesired compounds, depending on the roast level of the coffee, it may off-bal-

ance your target roast character of the final beer.

I find this to also be true when using coffee anywhere on the hot side of the brewing process. If using any hot-side process, it is important to consider adjusting any roasted malt additions to account for those harsher attributes. I would advise against using any hot-side coffee additions due to the benefits of cold-side additions that will be discussed later.

If you are more on the adventurous side and still want to try using coffee during the hot side, then I would suggest adding the coffee towards the end of the boil. I have seen good results with additions at 15 minutes left in the boil, and many swear by whirlpool additions.

### **COLD-SIDE ADDITIONS**

#### **Cold brew/cold steep**

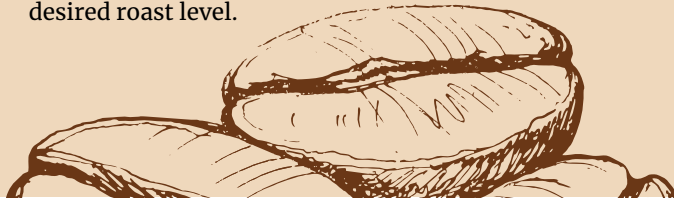
For the reasons just mentioned, most brewers choose to do a cold-brewed coffee steep. Cold steeping provides more of the coffee bean flavor while adding a smoother coffee roast character without much of the harshness and acidity that you get from hot-side additions. A cold steep can be done by adding a cheesecloth bag of coffee to a container of cold water (or a sample of beer taken from the fermenter), and allowing it to sit at refrigerator temperatures (34–36 °F/1–2 °C) for 16–20 hours before adding the liquid





## COFFEE ROASTING AT HOME USING AN OVEN

1. Preheat the oven to 475–500 °F (246–260 °C)
2. Spread green coffee beans onto a pan to create a single layer.
3. Once the oven is at temperature, place the pan into the oven, and stir evenly about every 2 minutes.
4. The color of the coffee beans will start to turn from green to a light brown, then start to rapidly turn to darker shades.
5. Listen for the first crack, which sounds like popcorn popping. This is a warning to start paying attention for the second crack. Continue to roast.
6. The second crack will sound like it is sizzling. From this point forward you need to constantly monitor the level of roast that you desire. During this stage of the process everything happens extremely fast.
7. Once you pull the pan from the oven pour the roasted coffee into a metal colander to allow for rapid cooling to lock in the properties at that roast level. This also allows for the chaff, or coffee husk, to come off the bean.
8. Total time in the oven is roughly 10–15 minutes, depending on desired roast level.



to the packaging vessel. When doing this, remember to sanitize all jars and any utensils. For cold-brewed coffee it is suggested to use coarsely ground coffee, however for brewing I often use whole beans for simplicity and consistency. Each coffee variety and roast will produce different flavors so your cold steeping time will vary depending on desired flavor impact. Play around with it and find what you like. A benefit to making cold-brewed coffee is that you can steep the coffee for an exact amount of time before removing the coffee bags or decanting. This will help dial in the exact coffee profile you are trying to achieve. This precise cold-brewed coffee can then be saved for later use, however it is best to use as early as possible, so try to plan accordingly.

### Dry Beaning

An alternative to the cold-brew steeping method would be to place the beans in a cheesecloth and use the dry hopping, or “dry beaning,” method in the fermenter. Steeping at fermentation temperatures can bring out pleasant coffee aromatics, but it will also have an easier time leaching

the unwanted tannins and astringency if left for too long. I have found the best time to add the coffee is right at cold crashing. You don’t want to let the beer stay on the coffee beans for too long. For my taste, I’ve found three days at ~34 °F (1 °C) will produce the height of aromas that are really vibrant. Steeping the coffee longer will produce a richer but less complex coffee profile, and will be less vibrant. This applies for the cold-brewed method as well as for dry beaning.

I am not a fan of adding coffee during the hot-side of brewing because I feel that there is a higher risk of extracting tannins and astringency from the coffee beans. While this is personal perspective on this approach, I will say that I have tried beers from numerous homebrewers who used hot-side applications, and many were outstanding, especially the beers that used whirlpool additions after the heat was cut off.

Other specialty methods like adding espresso, making French-pressed coffee, brewing a pot of coffee, or even a double brew of hot coffee are all acceptable methods and will produce their own unique flavors. If you

aren’t sure what approach to take, try many of them and taste the resulting differences firsthand.

### COFFEE DOSING RATE

Coffee addition rates can be almost at any range depending on what you are looking for, but here are some helpful tips that may guide you in deciding the dosing rate. Most coffee will provide 85 to 100 mg of caffeine per cup (8 oz./237 mL), depending on variety. Caffeine intoxication, which causes the “coffee shakes,” starts at 300 mg, so it might be wise not to exceed that. To make an 8 oz. (237 mL) cup of drinking coffee requires an average of 0.5 oz. (14 g) of ground coffee, which is equivalent to 60 g/L or 8 oz./gallon. Coffee variety and roast will directly affect the caffeine level, but should fall into the caffeine range of 85–100 mg.

A little bit can go a long way when brewing with coffee because most of the previously mentioned methods lead to the coffee being in contact with the wort or beer for an extended period of time compared to making a quick pot of coffee. At the brewery, for our coffee and cream stout, we do a coffee cold brew extract steep at a dosing rate of 0.82 ounce of whole bean coffee per gallon (6.1 g/L) of packageable beer. The overall coffee character is very much the focus of the beer, all while allowing the base beer to shine through and complement the coffee profile.

### MALT, UNFERMENTABLE SUGARS, AND RESIDUAL SWEETNESS

Your base beer style should guide you in the right direction on what malts to choose in designing your recipe. The malt will provide you with fermentable sugars, but you may also want some residual sweetness to balance any roasted character from the coffee. This can come from your malt selection or by creating unfermentable dextrans through higher mashing temperatures. Build your malt profile around your coffee and how you want to support its character. For our coffee and cream stout we chose to replace the standard 2-row





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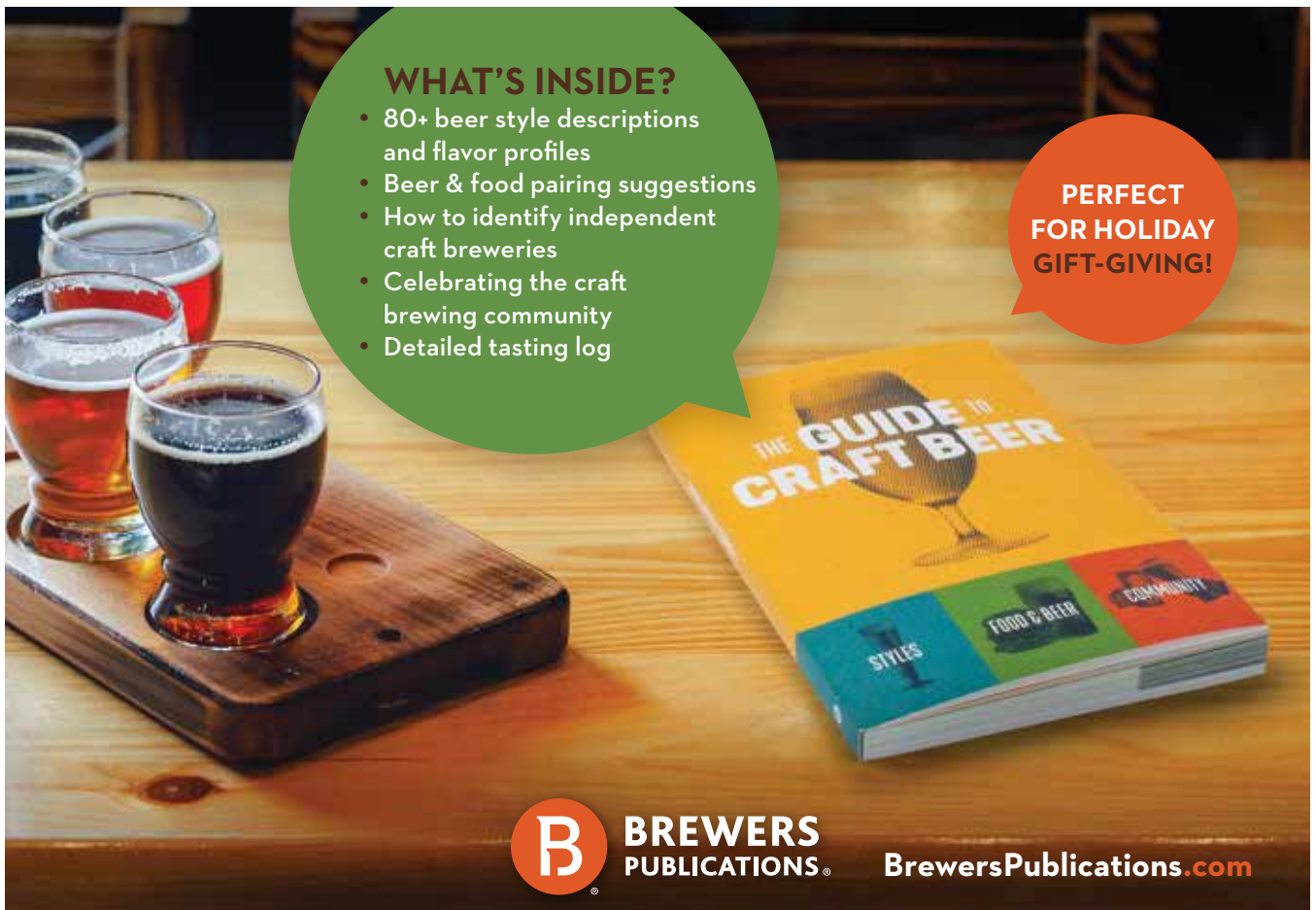
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malt that we normally use with a bolder Munich malt to provide more malt complexity. English malts that provide a richer bready malt character might also be a better choice over standard American 2-row malted barley, but it all depends on what your desired target character is. Understand your malts, manufacturers, and what each will provide to your finished beer.

Many coffee drinkers enjoy some

sugar and cream in their coffee, and coffee beer is usually no different. Using crystal malts will provide some residual sweetness to help balance out the bitterness from the coffee. Another favorite among brewers is to use lactose, which is an unfermentable sugar that produces a creamy sweetness. These unfermentable sugars can be used up to 10 to 15% of the grist bill. You could also choose a less attenuative yeast strain

that would give you a higher finishing gravity and more sweetness.

## WATER

### Beer Brewing Water

Even if you do not use salt additions it is extremely helpful to have a water report so that you know your base water mineral content, and more importantly your residual alkalinity (RA). As you roast coffee, and even malt, the product will start to become acidic. Being aware of your RA will allow you to formulate your recipe to not only hit proper mash pH, even when using high amounts of roasted malts, but to also account for the acidity of the coffee. This information will guide you in deciding on your best mash schedule to prevent the final beer from being too acidic and unbalanced. There are other things in your water report to look at such as calcium, chloride, and sulfate levels or ratios to enhance the perception of maltiness or hoppiness, however I feel that when using an already acidic coffee as an ingredient that the biggest concern is the water's RA in relation to the base style. The RA ranges for styles are -60 to 60 for pale beers, 60 to 120 for copper/amber/reds, and 120 to 240+ for dark beers.

Water is a detailed topic, but this should help guide you in the right direction even if you are not using any salts.

### Coffee Brewing Water

The same water chemistry theory applies to brewing coffee, but in this case we do not have other grains and mash pH to worry about. According to the Specialty Coffee Association the standards for minerals to brew a balanced coffee requires a total hardness of 50-175 ppm CaCO<sub>3</sub>, a carbonate hardness of 40-75 ppm CaCO<sub>3</sub>, and a pH of 6-8. This might help explain why some people add a pinch of salt to their coffee grounds when brewing a pot of coffee.

## MASH

Because brewers often favor the sweeter additions to balance the bitterness from the coffee, brewers often choose a mash temperature on

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the higher range of 152–154 °F (67–68 °C) to produce unfermentable dex- trins. You can use this technique in conjunction with using crystal malts and/or lactose additions to reach your target sweetness balance.

When brewing a dark beer, it is wise to know your residual RA in your water report. If the RA is in the lower range of 70 and below, then it might be beneficial to allow your base malts to do its main enzyme conversion mash, and add the dark malts during vorlauf, or recirculation. By doing this method the main enzyme conversion has already taken place, the mash pH is stable, and the additions of dark malts at this time will add to color and flavor. This will allow proper enzyme conversion in the mash without adding salts (like calcium carbonate) to keep the mash pH in the 5.2–5.6 range.

Because coffee, which is naturally acidic, is being showcased, it is important to have your base beer chemistry dialed in to create a smoother and better balanced beer due to proper water and mash chemistry.

### HOPS


Unless you are brewing a coffee IPA, chances are that your main goal with the hop addition is just to balance out the beer to let the coffee take the spotlight. I have found the best approach is to use a clean bittering hop variety with high alpha acids (such as Hallertau Magnum) to provide a clean bitterness while not using much vegetative hop matter as you would with lower alpha acid varieties. For 6–8% ABV beers I have had great success targeting 40–50 IBUs that come entirely from first wort hop additions.

### YEAST

The base beer style, yeast selection, fermentation temperature and schedule should all support the coffee character of your final beer. Knowing the yeast profile and what it will contribute to the final product will help guide you in making the right yeast selection. By choosing a less attenuative yeast strain it will leave more unfermented sugars providing sweetness to the final beer.

### CARBONATION

I personally love a great cask or even a nitro pour of a coffee beer, no matter the style. There is something magical about the cascading bubbles, rich fluffy foam, intense aromas, and silky mouthfeel that comes from a cask or nitro tap. If you are able to go this route, then that would be my suggestion. For the majority of homebrewers who don't have these options readily available, I would recommend to bot-

tle or keg condition the beer to allow for natural carbonation. I would also suggest targeting a slightly lower carbonation level of maybe 2.3 to 2.5 volumes of CO<sub>2</sub> (vs. the average 2.5–2.6 volumes of CO<sub>2</sub>). This will allow for a lighter, creamier mouthfeel vs. a high effervescent carbonation level that you might expect with an IPA. I have found that by week 3 of room temperature conditioning you reach a perfect sweet spot. 

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by Jack Horzempa

# TO DIRECT-PITCH OR REHYDRATE: THAT IS THE QUESTION

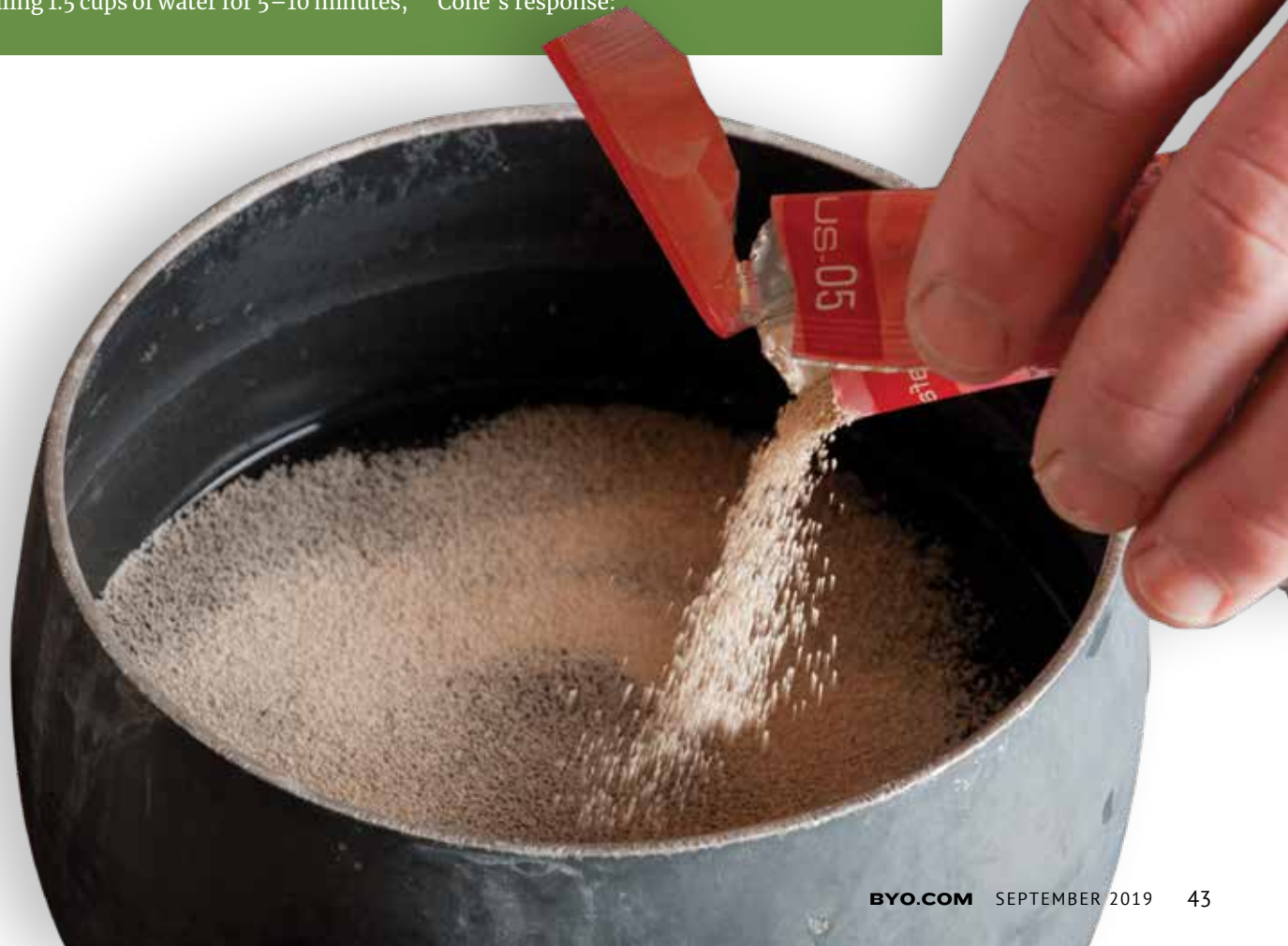
**F**rom a variety of homebrewing resources it has been stated that dry yeast should be rehydrated prior to pitching the yeast. Yet, this method that is often followed by homebrewers because it's the way it has been done for years, has been questioned and argued in recent years. It got me thinking, is rehydrating dry yeast really necessary?

## DRY YEAST CONVENTIONAL WISDOM

From the book *The New Complete Joy of Homebrewing* by Charlie Papazian: "One can significantly improve the performance of dried yeast (and consequently the flavor of your beer) by properly rehydrating it. Do this by boiling 1.5 cups of water for 5–10 minutes,

pour into a sanitized glass jar (washed and boiled for 15 minutes), cover with clean foil and let cool to 100–105 degrees °F (31–41 °C). Do not add any sugars. Add dried yeast and let rehydrate for 15–30 minutes, then bring the temperature of the rehydrated yeast close to the wort and pitch."

An internet forum of HomeBrew Digest (hbd.org) conducted a question and answer session with the late Dr. Clayton Cone of Lallemund in 2008. One of the members of HBD asked about the practice of rehydrating yeast. Luckily this exchange is available on the internet even today at: <https://koe hlerbeer.wordpress.com/2008/06/07/rehydrating-dry-yeast-with-dr-clayton-cone/>. I will highlight one paragraph of Dr. Clayton Cone's response:



“How do many beer and wine makers have successful fermentations when they ignore all the above (rehydrating dry yeast)? I believe that it is just a numbers game. Each gram of Active Dry Yeast contains about 20 billion live yeast cells. If you slightly damage the cells, they have a remarkable ability to recover in the rich wort. If you kill 60% of the cells you still have 8 billion cells per gram that can go on to do the job at a slower rate.”

There are two important aspects being discussed above:

**1.** There are 20 billion live yeast cells in a gram of yeast; this means that a fresh 11.5 gram sachet contains 230 billion live yeast cells.

**2.** He intimates that by direct pitching dry yeast there can be significant yeast death. He illustrates this by saying “If you kill 60% of the cells.” Although, another interpretation is that he mentions the success of dried yeast even with the loss of many cells for a broader reason, including incorrect rehydration of yeast (such as using distilled water, agitation, thermal shock while pitching, etc.), which is how José Pizarro, Regional Sales Manager for Fermentis, explained it when reading this quote. (Dr. Cone passed away in 2018.)

Similar information is presented within the book *Yeast: The Practical Guide to Beer Fermentation* by Chris White & Jamil Zainasheff: “Failure to rehydrate dry yeast properly will result in the death of approximately half the cells.”

There sure seems to be a common concern between Dr. Clayton Cone, Dr. Chris White, and Jamil Zainasheff that significant yeast cell death can occur if yeast is not rehydrated properly.

I think I’ve offered enough examples, but trust me when I say that many other homebrewing books include similar advice regarding the importance of rehydration, but what do the yeast manufacturers say?

## DRY YEAST MANUFACTURER DATA SHEETS

Yeast manufacturers provide data

sheets for their products that greatly aid in properly using them. Let’s take a look at what a couple of the larger dry yeast labs say on the subject.

### Lallemand (LalBrew)

Lallemand offers this best practice advice for a rehydration protocol for their yeast:

“• Sanitize the upper part of the pack (e.g. ethanol 70%) and the scissors before opening.

• Sprinkle the yeast on the surface of 10 times its weight in clean, sterilized water at 30–35 °C (86–95 °F).

• Leave it undisturbed for 15 minutes, stir gently to suspend yeast completely.

• Leave it for 5 more minutes at 30–35 °C (86–95 °F).

• Temperate in steps at 5-minute intervals of 10 °C (18 °F) to the temperature of the wort by mixing aliquots of wort in order to adjust the temperature of the hydrated yeast, with no delay.

### Please Do Not

• Do not use distilled or reverse osmosis water, as it will result in loss of viability.

• Do not stir right after sprinkling, as it may break the yeast cell membrane.

• Do not allow temperation to be carried out by natural heat loss. This will take too long and could result in loss of viability or vitality.”

There is a lot of useful information to take from this:

• You want to use 10 times the weight of sterile water (which contains minerals) for the rehydration process.

• The water temperature should be 86–95 °F (30–35 °C).

• Rehydrate for a total of 20 minutes (15 and 5).

• Get the yeast cream in temperature agreement with the wort via temperation.

• The rehydration protocol also states aerating the wort when pitching dry yeast is unnecessary because the yeast contains reserves of carbohydrates and unsaturated fatty acids to achieve active growth (except in high-gravity worts, where it is still recommended).

### Fermentis SafAle US-05 Yeast

Fermentis also offers rehydration instructions for their yeasts. Here is

what the US-05 data sheet says:

“Sprinkle the yeast in minimum 10 times its weight of sterile water or wort at 25 to 29 °C (77 °F to 84 °F). Leave to rest 15 to 30 minutes. Gently stir for 30 minutes, and pitch the resultant cream into the fermentation vessel. Alternatively, pitch the yeast directly in the fermentation vessel providing the temperature of the wort is above 20 °C (68 °F). Progressively sprinkle the dry yeast into the wort ensuring the yeast covers all the surface of wort available in order to avoid clumps. Leave for 30 minutes, then mix the wort using aeration or by wort addition.”

The rehydration protocol from Fermentis is similar to that from Lallemand, but with some differing values for temperature (77–84 °F/25–29 °C) and rehydration time duration of 45–60 minutes (15–30 and 30).

I would be remiss to not highlight that Fermentis also provides instruction for just conducting a direct pitch of the dry yeast (as detailed in the above paragraph from the data sheet).

## STRAIGHT FROM THE MANUFACTURERS

As discussed, there is indeed quite a bit of documentation about the importance and benefits of rehydrating dry yeast. I figured I would reach out to a couple of the yeast manufacturers (Lallemand and Fermentis) to see if there are any more details here.

### Lallemand (LalBrew)

Lallemand, who produces LalBrew (formerly called Danstar) dried yeast, state on their website that rehydration is recommended, but not essential. “Rehydration is a simple process which allows the dry yeast to become liquid yeast, reducing the osmotic stress and enhancing a homogeneous dispersion,” it says.

In discussion with Eric Abbott, Lallemand’s Technical Advisor, he further informed me that “the yeast cell membrane is more non-selectively permeable during the first few minutes of rehydration, so rehydrating in water instead of directly in the beer reduces the risk of absorbing toxins into the cell.”

That said, there have been improvements in dry yeast production at



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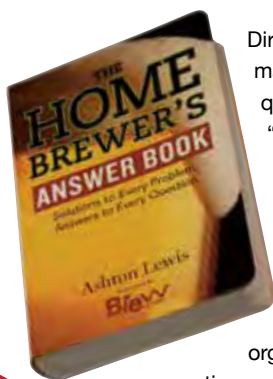
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Lallemand so dried yeast is now more robust and resistant to stress than it previously was. Taking it a step further, the impacts of yeast rehydration can be strain dependent, however Lallemand is confident in recommending dry pitching for any of their stains.

“We do see some strain-specific differences in lag phase, attenuation, and flavor, but these differences are generally quite small and should not deter any brewer from trying dry pitching. In some cases dry pitching gives better performance and we now recommend dry pitching our New England and BRY-97 strains as recent lab trials have shown shorter lag phases as well as greater attenuation. These tests are ongoing as we test dry pitching in different types of wort (high gravity, sour, etc.)”

Eric added that Lallemand will provide strain-specific recommendations for a particular beer based on their most current research.

### Fermentis

Just like Lallemand, Fermentis has conducted continual process improvement of their production of dry yeast. They recently conducted a

scientific study in collaboration with the Institut Meurice and Odisee University to quantify the ability of their yeast strains to survive rehydration in a number of varying media and rehydration conditions. From discussion with José Pizarro of Fermentis, the results of these studies revealed some interesting facts.


For one, Fermentis yeast strains are very tolerant of the temperature of rehydration. They studied rehydration temperatures of 46.4, 53.6, 60.8, 68, 89.6 and 104 °F (8, 12, 16, 20, 32, and 40 °C) and for a given yeast strain the viability performance was similar. They also studied rehydration with varying media of water (46.4 and 68 °F/8 and 20 °C) and wort of varying density (1.028, 1.061, and 1.106 also at 46.4/68 °F). Again, the viability performance was similar on a per strain basis. These results indicate that the Fermentis strains are very robust with the ability to have high viability when pitched under a variety of conditions. Just as was indicated by Lallemand, the exact performance varies depending on the strain.

The Fermentis, Institut Meurice & Odisee University team further stud-

ied the fermentation performance of all of their strains under varying pitch conditions in regards to time of fermentation, amount of volatile compounds produced (e.g., VDK, esters, higher alcohols, acetaldehyde), ethanol produced, and attenuation achieved. Once again, they achieved consistent performance across varying conditions (see Chart 1, below).

Based upon these results there is no significant difference in pitching Fermentis homebrewing strains directly vs. conducting a rehydration process. (A snapshot of the data from this study is available to read at <https://fermentis.com/en/news-from-fermentis/technical-reviews/e2u-direct-pitching/> and the entire study is accessible upon request).

### WHERE DO WE GO FROM HERE?

In my research of this article I found nothing negative about rehydrating dry yeast, however it seems that there is no longer the same need to do it for most beer styles as there used to be. The choice really is up to the individual brewer and the process they feel most comfortable following. 

**Chart I: Fermentation Performance of SafAle US-05**

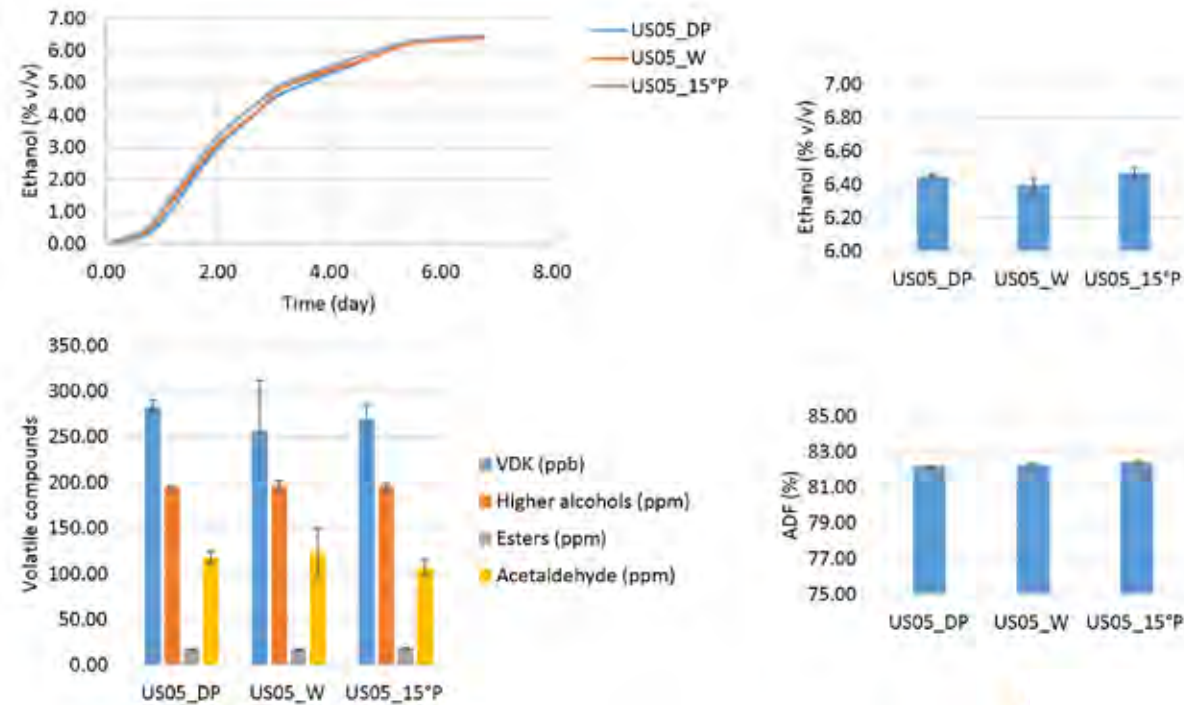


Chart courtesy of Fermentis

(Pitching rate 50 g/hL, 15°P, 68 °F/20 °C) and the concentration of ethanol, residual sugars and volatiles (acetaldehyde, esters, higher alcohols and vicinal diketones) at the end of fermentation for 3 different rehydration procedures (in triplicate). **DP:** Direct pitching without rehydration. **W:** Rehydration in water at 86 °F (30 °C) with moderate agitation. **15°P:** rehydration in 15°P wort at 68 °F (20 °C) with moderate agitation.



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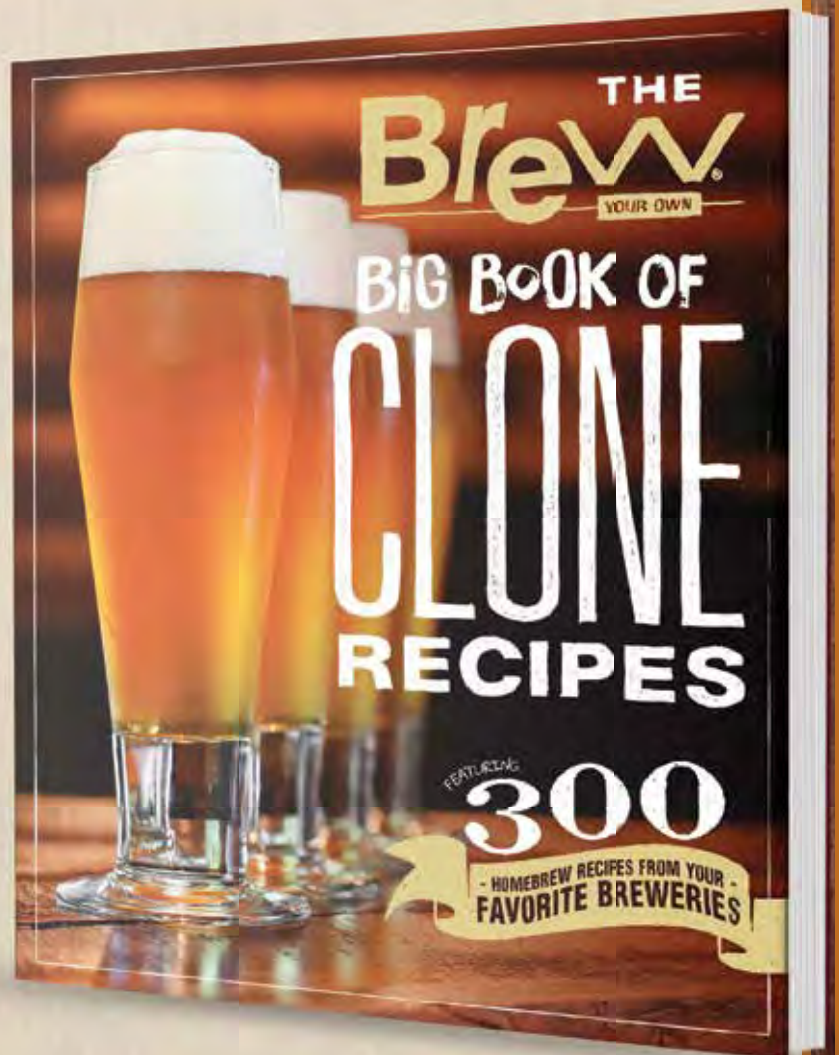
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**9:15 A.M. – 10 A.M.**  
Brad Smith on Recipe Design



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



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



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



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



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



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



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**SATURDAY, MARCH 28, 2020 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.



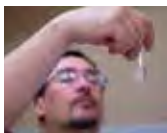
**ADVANCED RECIPE FORMULATION** – *with Brad Smith* – Take your recipe creations to the next level by dialing in the specific grain bill, hop schedule, ingredient proportions, and water treatments to meet your brewing goals. Brad Smith, owner of Beersmith software and a *Brew Your Own* Contributing Writer, 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, refractometers, 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 this critical brewing ingredient.



**MEADMAKING** – *with Jason Phelps* – Interest in mead is on the rise throughout North America. Now you can learn all the steps you need to successfully craft your own homemade meads. Join professional Meadmaker Jason Phelps as he takes you through the keys to making a great mead at home including key techniques, yeast selection, fermentation strategies, and more. Learn how to select and work with different honey varieties as well as best practices for adding ingredients such as fruits and spices to your mead.



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



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

**SUNDAY, MARCH 29, 2020**



**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.

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Full Event Details Available at: [BYOBootCamp.com](http://BYOBootCamp.com)**



BREWING  
TRADITIONAL

# SCOTTISH ALES

by Gordon Strong

Sorting the truths and  
myths of brewing these  
malt-forward styles







Photo by Charles A. Parker/Images Plus

**T**he beer styles of Scotland have been misunderstood for years. While entire books have been written on these beers, it seems that many brewers and beer enthusiasts have focused on minor points, amplified incorrect information, broadly generalized the country, and taken homebrewer techniques as traditional commercial brewing methods. This really isn't unique to Scotland, as I've seen this occur with other beer styles as well (looking at you, saison). People develop stories that get retold, and inevitably errors creep in.

As the primary author of the Beer Judge Certification Program (BJCP) Style Guidelines, I've tried to comprehend the modern styles, taste and characterize their flavor profiles, and understand their histories and production techniques. We've revised our guidelines as more sources are published, and tried to correct the mistakes of the past. But the more I read, the more complicated the subject seems to get.

What I have been able to deduce is that the modern versions of traditional Scottish styles are fairly easy to understand and characterize, but the current state doesn't say anything about what existed historically or how the styles changed over time. I'm not going to delve deeply into history (you're welcome), but just understand that beer styles aren't static and that even if styles have existed for a long time it doesn't mean that the beers always had the same character or were produced in the same way.



## MODERN STYLE OVERVIEW

There are really only three traditional beer styles broadly available today in Scotland: the 70/- Scottish heavy, the 80/- Scottish export, and the strong Scotch ale (also called a wee heavy). The 60/- Scottish light is very hard to find; few breweries produce it, and it is generally a cask-only style. All these styles took modern form after World War II.

I hear you probably saying, “But there were shilling ales before then! And Scotland was long known for its strong beers.” Yes, that’s true, but the beers today are not the same as in the past. Shilling ales (70/- is pronounced as “seventy shilling”) were originally based on the price of beer in hogshead casks, but there’s no way that would be consistent over time. Scotland (as part of the United Kingdom) no longer even uses shillings as currency. But the name has stuck; about all it says is that bigger numbers mean stronger beers, at least within the same brewery.

Currently, the 60/- is similar to an English dark mild, but at around a 1.030 original gravity. The 70/- is similar to an English ordinary bitter at about 1.035 original gravity, and the 80/- is like an English best bitter at around 1.040 original gravity. The Scottish beers have a different balance and flavor profile, but they fill a similar market position as those English beers.

The strong Scotch ale is much stronger, although not as big as some barleywines. The style has two main variations, a more modest 5% ABV or so beer, and the more widely known 8–9% ABV beer. These two types descended from Edinburgh ales, a stronger, malty beer that was brewed in a range of strengths, similar to Burton ale (although at half the hopping rate). As gravities were lowered over time, some of the variations ceased to be produced.

The BJCP groups Scottish ales in Category 14, and includes the light, heavy, and export styles. The strong Scotch ale is in Category 17 (Strong British Ale) as style 17C, Wee Heavy. Even though they are in different categories based on strength,

the four beer styles share some common characteristics.

## CHARACTERISTICS OF SCOTTISH ALES

Scottish ales are malty in the balance, darker in color, and fuller in body and residual sweetness. They are generally weaker in strength, although the strong Scotch ale can be quite respectable. The 60/-, 70/-, and 80/- beers have a similar flavor profile, and are often produced through the parti-gyling process. The 60/- is darker due to added coloring, and the 70/- tends to be lighter in color (but still at least amber).

The flavor profile is often described as caramelly, but this does not historically come from crystal malt, which began to be used around World War I. Invert sugar of varying colors provided much of the flavor, similar to how the Belgians produce some of their ales. Caramel coloring adjusted the final color, although black malt and other dark malts such as chocolate malt can provide some of the color now. Roasted barley is not commonly used, as it is in Irish ales.

Some examples of Scottish ales have a faint smoky character, which has often been misunderstood and misinterpreted. It does not come from peat-smoked malt, which Scottish breweries don’t use. Perhaps some are confused by the use of distiller’s malt to make peaty Scotch whisky, particularly those from Islay. The main historical brewing centers were in lowland industrial centers like Edinburgh and Alloa; not where peat is found. Peat-smoked malt produces medicinal phenolic flavors with a strong earthy (dirt-like) character that is totally undesirable in beer. Light use of dark malts is more likely the source.

Scottish ales are often compared to English ales since the latter are more widely known. Since the styles share some common history, tracking the diverging characteristics is interesting. Ron Pattinson, in his blog *Shut up about Barclay Perkins*, compared historical brewing records to derive some interesting differences between similar beers from the two countries.

In general, Scottish beers compared to equivalent English beers, were:

- **Weaker** (lower original gravity and ABV)
- **Lower attenuation**
- **Less highly hopped**
- **Higher in residual sweetness** (higher final gravity, more body, sweeter balance)
- **Darker**, often through the additional caramel coloring
- **Produced using cooler fermentation temperatures** (lower pitch temperature, lower maximum temperature)
- **Produced using shorter boil times**

Some of these attributes are well known, but some contradict popular conceptions, such as the use of long boil times to caramelize the wort. More of these characteristics have been exaggerated, such as cooler fermentation temperatures meaning lager-like (this appeared in Greg Noonan’s *Scotch Ale* book). Cool ale temperatures, more like what you would see with Kölsch and altbier, are used for fermentation (59 °F/15 °C, not 50 °F/10 °C, for instance).

One observation I have about the differences in Scottish and English beers is that while there are measurable distinctions, those differences are not huge. According to Pattinson, hopping is maybe 5–10% less, temperatures are a few degrees cooler, and attenuation is 5–6% less — not big differences but enough to affect the balance of the beer and indicate perhaps a national flavor preference.

While some of the stories surrounding Scottish ales seem unsupported, I decided to go back and look at how some earlier beer writers described these beers to see what was so wrong. Turns out, it’s often a matter of interpretation or later emphasis.

In 1988, Michael Jackson wrote in *New World Guide to Beer* a total of two pages on Scotland. He described Scotland as a cold country that produced full-bodied, malty ales, often dark, in a full range of gravities. He said black malt provided color and dryness, often with crystal malt; however, the largest part of the grist is



Photo courtesy of Shutterstock.com

*One misconception about traditional Scottish ales is that commercial breweries relied on extended boiling for the caramelly flavor of these beers. While homebrewers may do this method to get similar resulting tastes, it is not a traditional Scottish technique.*

pale ale malt. Not as attenuated or as heavily hopped as English beers, they are meant to be malty. He noted Belhaven, Caledonian, Younger's, Maclay, Broughton, and McEwan as well-regarded breweries, with Tennent getting a brief mention as a lager producer. I think all of this is correct.

Looking at Roger Protz and the *Real Ale Almanac* of 1995, he gave parameters and ingredients for several commercial beers. They show mostly pale ale malt, 1–2% black malt, crystal malt under 5%, and sugar. A few breweries used roasted barley or chocolate malt instead of black malt. Seems fairly consistent.

Greg Noonan, writing the *Scotch Ale* book in 1991, seems to be the source of some of the confusion but also as providing some good information. For instance, he says the maltiness is not from crystal malt, and that its usage is rare; the beers are rich, sweet, and darker in color; hop flavor is generally not evident; and hop bitterness helps balance residual sweetness. He says that sugar and maize are used, not peat smoked malt. He also says the yeast is not overly fruity, that it under attenuates beer, and that it is flocculent and alcohol-tolerant. I think this all sounds pretty good too.

However, Noonan does say that roasted barley provides the characteristic flavor of Scottish ales and that they use lager-like fermentation

regimes. Perhaps because he wrote a book on lager brewing he was using confirmation bias to see what he wanted to see. Or that he used data from a much earlier era when beers were very strong and pitching temperatures were low because they rose so much during fermentation. Unfortunately, Noonan has passed away so he can't be questioned about how he came to believe this theory. But Ron Pattinson's analysis of brewing records shows that it wasn't the case.

So while there are some problems with stories and especially with cause-and-effect, I think many of the earlier writers were fairly accurate in their descriptions. But the creation of recipes using non-traditional techniques and ingredients caused some brewers to misunderstand the history and the nature of Scottish beer. I think it's fine to identify how Scottish brewers traditionally made beer and then offer modern versions that produce beer with similar flavors, as long as the two concepts aren't merged.

### **PRODUCING SCOTTISH ALES**

The bulk of the grist of Scottish ales is pale ale malt. Scotland maltsters would produce malt from mostly imported barley, and would produce a slightly darker and more dextrinous malt. Golden Promise is a highly regarded example of this malt, and is one of my favorite base malts. English

malts are a good substitute, and I have sometimes used an equal mix of Maris Otter and mild malt.

Corn (either grits or flaked maize) and forms of sugar, typically invert brewing sugars of various color grades, are commonly used. Color adjustment through the use of caramel coloring of the finished beer would complete the recipe, but modern recipes often use some small amounts of dark malt and lower percentages of crystal malt.

Some of the brewing ingredients for Scottish ales can be hard for homebrewers to find, such as dark invert sugars and food-grade caramel coloring. These are often commercial products that aren't readily available in the United States for homebrewers. However, restaurant supply stores are a good source, or they can be found on the Internet (search for "food-grade caramel coloring"). Caramel coloring adds color and a bit of aroma but very little flavor.

Homebrewers can use 1–3% debittered black malt or other dark grain for similar color adjustment purposes. A light use of dark malts can produce the reddish-copper hues without the undesirable roasted flavors. Roasted barley is not traditional, but at these low levels there is very little flavor difference from black malt. They are mostly there to deepen the color.

Invert sugar is mostly a commer-



# SCOTTISH ALE

## RECIPE

*This recipe is an attempt to provide a homebrew recipe for a typical Scottish light (ironically, which is dark). It can be scaled up in strength to make a 70/- or 80/- but reduce the color a bit to make it coppery. It is attempting to use authentic ingredients.*



### SCOTTISH 60/- LIGHT

(5 gallons/19 L, all-grain)  
OG = 1.032 FG = 1.012  
IBU = 17 SRM = 18 ABV = 2.5%



#### INGREDIENTS

4 lbs. (1.8 kg) Golden Promise pale ale malt  
1 lb. (0.45 kg) flaked maize  
1 lb. (0.45 kg) Invert No. 3 sugar or dark Belgian candi syrup  
3 oz. (85 g) debittered black malt  
3.4 AAU Fuggle hops (60 min.)  
(0.75 oz./21 g at 4.5% alpha acids)  
0.25 oz. (7 g) Golding hops (5 min.)  
White Labs WLP028 (Edinburgh Scottish Ale), Wyeast 1728 (Scottish Ale), or SafAle US-05 yeast  
 $\frac{3}{4}$  cup corn sugar (if priming)

#### STEP BY STEP

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

Mash the Golden Promise and maize at 158 °F (70 °C) for 60 minutes. Start recirculating wort. Add the black malt and raise the temperature to 168 °F (76 °C) 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. Add the invert sugar with 15 minutes left in the boil.

Chill the wort to 59 °F (15 °C), pitch the yeast, and ferment until complete.

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

### SCOTTISH 60/- LIGHT

(5 gallons/19 L, extract with grains)  
OG = 1.031 FG = 1.012  
IBU = 17 SRM = 18 ABV = 2.5%



#### INGREDIENTS

3.3 lbs. (1 kg) Maris Otter liquid pale malt extract  
1 lb. (0.45 kg) Invert No. 3 sugar or dark Belgian candi syrup  
3 oz. (85 g) debittered black malt  
3.4 AAU Fuggle hops (60 min.)  
(0.75 oz./21 g at 4.5% alpha acids)  
0.25 oz. (7 g) Golding hops (5 min.)  
White Labs WLP028 (Edinburgh Scottish Ale), Wyeast 1728 (Scottish Ale), or SafAle US-05 yeast  
 $\frac{3}{4}$  cup corn sugar (if priming)

#### STEP BY STEP

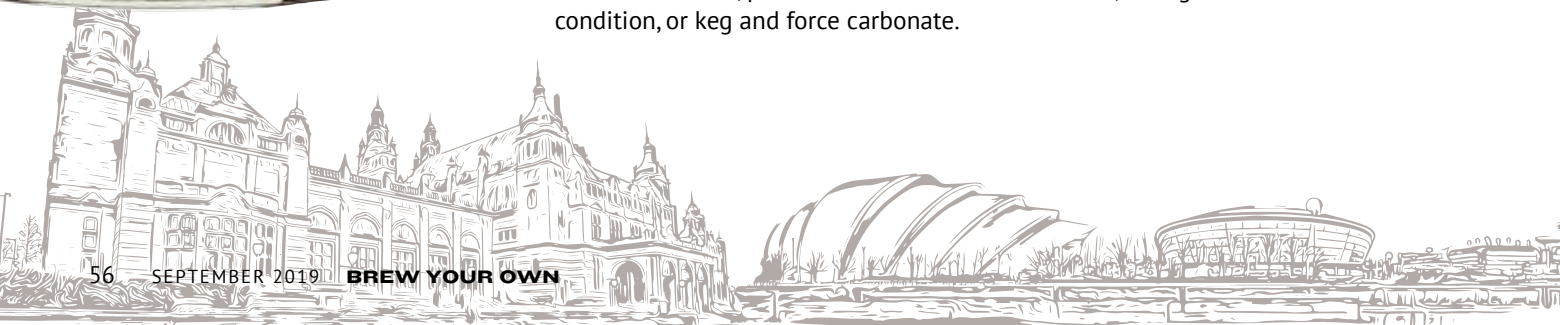
Use 6.5 gallons (24.5 L) of water in the brew kettle; heat to 158 °F (70 °C).

Steep the black malt for 15 minutes. Remove and rinse. Turn off the heat. Add the malt extract and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil.

Boil the wort for 60 minutes, adding hops at the times indicated in the recipe. Add the invert sugar with 15 minutes left in the boil.

Chill the wort to 59 °F (15 °C), pitch the yeast, and ferment until complete.

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



# SCOTTISH ALE

## RECIPE

*This recipe is a homebrew version using multiple grains to mimic the sugar flavors. It can be scaled up or down for a 60/- or 80/-. Just remember to color it a bit darker if making it as a 60/-.*

### SCOTTISH 70/- HEAVY

(5 gallons/19 L, all-grain)  
OG = 1.035 FG = 1.012  
IBU = 13 SRM = 13 ABV = 3%

#### INGREDIENTS

6.5 lbs. (2.7 kg) Golden Promise pale ale malt  
6 oz. (170 g) flaked barley  
3 oz. (85 g) Caramunich® II malt  
1.5 oz. (43 g) pale chocolate malt  
1.5 oz. (43 g) roasted barley  
3 AAU Fuggle hops (60 min)  
(0.5 oz./14 g at 5.9% alpha acids)  
White Labs WLP028 (Edinburgh Scottish Ale), Wyeast 1728 (Scottish Ale), or SafAle US-05 yeast  
¾ cup corn sugar (if priming)

#### STEP BY STEP

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

Mash the Golden Promise and flaked barley at 158 °F (70 °C) for 60 minutes. Start recirculating wort. Add the darker malt and raise the temperature to 168 °F (76 °C) for 15 minutes.

Sparge slowly and collect 6.5 gallons (24.5 L) of wort. Boil the wort for 90 minutes, adding hops at the times indicated in the recipe. Chill the wort to 59 °F (15 °C), pitch the yeast, and ferment until complete.

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

### SCOTTISH 70/- HEAVY

(5 gallons/19 L, extract with grains)  
OG = 1.035 FG = 1.012  
IBU = 13 SRM = 13 ABV = 3%

#### INGREDIENTS

4.4 lbs. (2 kg) Maris Otter liquid malt extract  
3 oz. (85 g) Caramunich® II malt  
1.5 oz. (43 g) pale chocolate malt  
1.5 oz. (43 g) roasted barley  
3 AAU Fuggle hops (60 min)  
(0.5 oz./14 g at 5.9% alpha acids)  
White Labs WLP028 (Edinburgh Scottish Ale), Wyeast 1728 (Scottish Ale), or SafAle US-05 yeast  
¾ cup corn sugar (if priming)

#### STEP BY STEP

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

Steep the malts for 30 minutes. Remove and rinse. Turn off the heat. Add the malt extract and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil.

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

Chill the wort to 59 °F (15 °C), pitch the yeast, and ferment until complete.

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





# SCOTTISH ALE

## RECIPE

*This recipe uses caramelization and is meant to be like Traquair House Ale. It can be scaled up or down to hit an alcohol preference; 8.5% would be like an export to Belgium.*



### STRONG SCOTCH ALE

(5 gallons/19 L, all-grain)  
OG = 1.074 FG = 1.020  
IBU = 27 SRM = 19 ABV = 7.1%



#### INGREDIENTS

15 lbs. (6.8 kg) Golden Promise malt  
5 oz. (142 g) debittered black malt  
8.3 AAU Golding hops (60 min)  
(1.5 oz./43 g at 5.5% alpha acids)  
White Labs WLP028 (Edinburgh  
Scottish Ale), Wyeast 1728 (Scottish  
Ale), or SafAle US-05 yeast  
¾ cup corn sugar (if priming)

#### STEP BY STEP

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

Mash the Golden Promise at 158 °F (70 °C) for 60 minutes. Start recirculating wort. Add the black malt and raise the temperature to 168 °F (76 °C) for 15 minutes.

Sparge slowly and collect 6.5 gallons (24.5 L) of wort. Take the first gallon (4 L) of runnings and boil separately in a pot over high heat to reduce to 1 quart (1 L); be careful to stir and not scorch the wort. Add the reduced wort back to the kettle.

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

Chill the wort to 59 °F (15 °C), pitch the yeast, and ferment until complete.

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

### STRONG SCOTCH ALE

(5 gallons/19 L,  
extract with grains)  
OG = 1.074 FG = 1.020  
IBU = 27 SRM = 19 ABV = 7.1%



#### INGREDIENTS

9.9 lbs. (4.5 kg) Maris Otter liquid malt  
extract  
5 oz. (142 g) debittered black malt  
8.3 AAU Golding hops (60 min)  
(1.5 oz./43 g at 5.5% alpha acids)  
White Labs WLP028 (Edinburgh  
Scottish Ale), Wyeast 1728 (Scottish  
Ale), or SafAle US-05 yeast  
¾ cup corn sugar (if priming)

#### STEP BY STEP

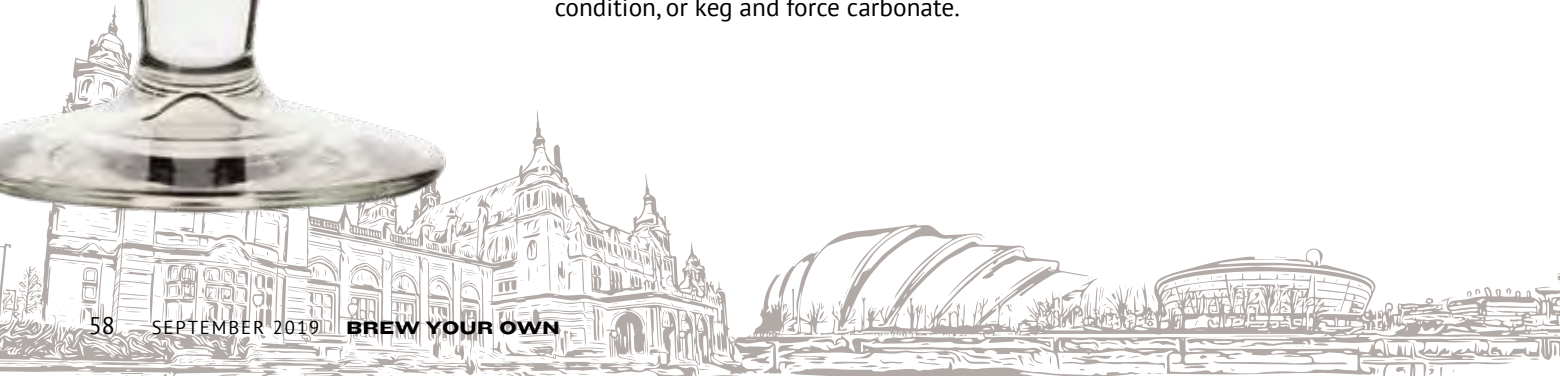
Use 6.5 gallons (24.5 L) of water in the brew kettle; heat to 158 °F (70 °C).

Steep the black malt for 15 minutes. Remove and rinse. Turn off the heat. Add the malt extract and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil.

Boil the wort for 60 minutes, adding hops at the times indicated in the recipe. You may want to remove 1 gallon (4 L) of wort to boil down to 1 qt. (1 L) as well.

Chill the wort to 59 °F (15 °C), pitch the yeast, and ferment until complete.

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



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cial product, so homebrewers have difficulty acquiring it in the right sizes. Ragus is a commercial supplier, and makes the full range of sugars from the paler No. 1 to the very dark No. 4. Brewers can attempt to make their own invert sugar, which involves adding acid and then cooking the sugar to the right color. Blending golden syrup and blackstrap molasses to the right color can approximate the flavors. Or try substituting available invert syrups for homebrewers, which are used in Belgian beers.

To substitute for invert sugar, try to match the syrup with the approximate color ranges, understanding that EBC is roughly twice SRM in color. If you use syrups from Candi Syrup, Inc. or Dark Candi, Inc., D-45 or Am is like Invert No. 2, and D-90 or D is like Invert No. 3. Lyle's Golden

so homebrewers can safely make a single mash version without any loss of authenticity.

Higher mash temperatures can assist with producing dextrinous worts that will retain more body after fermentation. Some homebrewers add flaked grains to provide this body without relying on mash control. I think it's important to note that a higher finishing gravity will give a beer body as well, so perhaps the emphasis on mash temperature is a bit misguided. Yeast and fermentation schedules can play just as important a role.

Jamil Zainasheff in *Brewing Classic Styles* offers two approaches to brewing Scottish ales, one using caramelization and one using complex malt bills. Neither is really traditional, but they do show the ways that homebrewers have attempted to recreate

buttery flavors that judges mistook for diacetyl from fermentation flaws. If you think about it, this is just another way of producing similar flavors by heating sugar. It's just not a historically accurate commercial technique for the style.

I also have used the approach of creating complex grists in trying to recreate the flavor profile of Scottish ales, blending multiple grains to achieve complexity (yes, some including peat smoked malt). Approaching recipe formulation in these two ways (sugar syrups or complex grists) is similar to how I've built several Belgian beer recipes.

Building flavor profiles by trying to match ingredient flavors with those of the finished beer is a tried and true homebrewer method for recipe formulation. The problem is that when a

## “ There is a distinctive character to traditional Scottish beer styles that differentiates it from those from England, Ireland, and other nearby countries. ”

Syrup is Invert No. 1. The color ranges for the Ragus products are 25–35 EBC for Invert No. 1, 60–70 EBC for Invert No. 2, and 120–140 EBC for Invert No. 3. Caramel coloring by comparison is very concentrated and can have an EBC in the thousands.

The balance of Scottish ales remains malty and somewhat sweet due to a higher finishing gravity, lower alcohol, and lower hopping rates. Sometimes Scottish ale recipes seem deceptively bitter, but remember that the sweeter finishes will mask some of the bitterness. English variety hops can be used, although historically Scottish brewers used imported hops from many sources including England, the United States, and mainland Europe.

Scottish brewers tend to use a single-infusion mash, often with multiple sparges. This differs from the English tradition of using multiple mashes. However, both traditions include parti-gyling to produce multiple beers from the same batch. This is a commercial consideration,

flavor profiles based on available ingredients. I have used both approaches in my own recipe formulations over the years.

I first read about caramelizing first runnings to produce these flavors in the 1990s online in a post by Scott Abene (aka Skotrat). The method seems to have been inspired by Michael Jackson's description of Traquair House Ale, and the brewery he called, “the most Scottish of breweries” — despite it being in operation only since 1965. The brewery was said to use a three-hour boil (possibly true, but not typical of other commercial Scottish breweries).

I have used that technique in several beers of varying strengths, including one monster Scotch ale with an OG of 1.140. That was part of an experiment to see how big a beer I could make if I completely filled my (15.5-gallon/59-L) mash tun. I boiled a gallon (4 L) of the first runnings down to a quart (1 L), a concentration of four times. It was delicious, but on occasion the technique did produce

homebrewer finds a good match, they then make the leap of logic to say that commercial brewers must use the same recipes to make their beers because they taste the same. That's correlation without causation, a common logic fallacy. Just because things seem related doesn't mean they have anything to do with one another. However, the opposite is true too — just because brewers didn't follow traditional methods, doesn't mean that they can't produce similar tasting beers. There are often multiple paths to the same destination.

### **HISTORICAL EVOLUTION**

Historically (meaning between the 1707 Acts of Union and the 1880 Free Mash Tun Act), Scottish beer and English beer was actually quite similar. The national characteristics of beer began to diverge in the late 1800s, and the change was accelerated by the effects of two world wars in the first half of the 20th century. Laws, taxation, availability of ingredients, and economic conditions took their toll on

beer styles, as gravities plunged and styles were eliminated since there was too much overlap.

Scotland at one time had a large export trade, including to England. Its India pale ale was a big export beer to India, and the strong Edinburgh ale was also widely known. After World War I, the strong Scotch ales became highly regarded in Belgium, and has influenced beer styles there to this day (Scotch Silly is a Belgian version of strong Scotch ale, for instance).


Mild ales (not like dark mild, but meaning beers meant to be consumed young) existed in many strengths. These beers were known as shilling ales when bottled, or mild ales when on draft. World War I finally did away with these beers, although the names were later repurposed. The market space for weaker mild was taken by the new 60/-.

Porter was never very popular in Scotland, but stout was more readily found. The Scottish version was fairly sweet, however, as suited to the national palate. Lagers of the Pilsner type became more popular after Tennent's Lager was introduced in 1889.

After World War II, the slow decline of Scottish breweries began as the British Empire fell apart. Mergers, acquisitions, and outright closures led to a period of consolidation, and coupled with foreign ownership led to many brands being lost. A sad story but not unique to Scotland as this happened in other countries before the craft beer renaissance.

### A NEW HOPE

Scotland has a long and proud brewing history, one worth understanding and appreciating. There is a distinctive character to traditional Scottish beer styles that differentiates it from those from England, Ireland, and other nearby countries. While ingredients and production techniques can vary, as long as the final beers fit the characteristic flavor profile, the styles can be preserved.

To that end, on pages 56–58 I have provided three Scottish ale recipes that illustrate the various approaches used by homebrewers to achieve the flavors in Scottish beers. 

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# A SCOTTISH BREWING REVOLUTION

**The New Age Of Scottish Brewing Is Upon Us**

story by Richard Taylor  
recipes by Mike Habrat



“I’m kind of a wee guy,” says Chris Lewis, from behind a table in a carpeted function suite in Aberdeen, Scotland. “And I always thought that I should have something to rely on, if I ever got sent to prison. I figured if I was the guy that could make alcohol then someone would find a use for me. Nothing worse would happen, you know?”

Just when you thought you’d heard all the reasons why people start homebrewing, another arrives. Chris — his comment having scored the biggest laugh of a day of brewer-led tastings at the 2019 BrewDog ‘PunkAGM’ — is just one of dozens of homebrew-heroes who have scaled their passion up into a full career in the northernmost part of the United Kingdom.

As Director, Head Brewer, and Sales Rep for Glasgow-based Dead End Brew Machine he is a one-man band in full swing. With only five years of commercial experience under his belt, it’s the foundations of his homebrew escapades that underpin all of his success — even if in the beginning (like many) he had no aspirations to go full-time with any of it.



“I really enjoyed making something tangible,” he says. “And also the freedom to throw the kitchen sink at stuff and make beers and styles that were either not available or not commercially viable. Homebrewing quickly became a total obsession, brewing far more than I could ever reasonably drink.” For Chris, the challenge of homebrewing was challenge enough.

At the other end of Scotland’s main artery, the M8 motorway, Paul Gibson was having exactly the same thoughts as he began homebrewing in Edinburgh. “With every new brew the aim was to perfect my technique and ultimately make the final product better. At no point had I any thoughts

about taking things to the next level. My focus was just to make the next beer better.”

For him, like Chris, homebrewing was a chance to experiment above all else. Before he launched the Campervan Brewery in 2015, Paul’s biggest pull was walking past produce markets and buying “random fruit” to put in his beers. “Even walking past my kitchen cupboard, it became difficult not to grab some spice or herb to add to my latest brew,” he confesses.

## TURNING THE HOBBY TO A CAREER

There are just two of the new outlooks that have lit a fire underneath Scottish brewing in the last decade.

The traditional brewing centers and stylistic leanings have gone out the window as homebrewers who have tweaked and developed a myriad of different beers turn their pastime into a career. The stereotype of Scots mist over the moors and dark, peated wee heavy is just that.

“I never once, in fact, made a traditional Scottish style when homebrewing,” says Dave Grant, Managing Director and Co-Founder of Fierce Beer, a multi-award winning brewery based in the shadow of Aberdeen Airport. “There’s not much about them that excites me. My first homebrew was an IPA, the second a chipotle porter (that is now a core beer for Fierce), and the third a raspberry pale ale, which is now Cranachan Killer.”

If the progression of brewers from their garages or kitchens into purpose-built facilities brings with it a thread of commonality, today in Scotland it is one of variety and experimentation. Nothing is off limits, it seems. Chris from Dead End Brew Machine spent the final two years of his homebrewing life solely focusing on *Brettanomyces* and sour beers; capturing wild yeast, foraging for ingredients, and blending the results.

Homebrewing in Scotland has clearly moved on from the days of levering open cans of extract.

One brewer who knows all about that is Paul Fallen. Long before he founded his eponymous brewery in central Stirlingshire, he was cutting his teeth on traditional English ales thanks to all-extract kits of a commonly available base-homebrew 3.8% amber ale.

“It was awful,” admits Paul. His first homebrew rig was a Christmas gift from his wife; for a hobby he could pursue inside the house whilst looking after their children.

“Pales and IPAs were my go-to attempts 15 years ago and it’s still the basis of what we do now,” he says. Fallen Brewing’s beers are renowned for their quality, and Paul attributes this to an outlook that never really synced with those of Chris, Paul, and Dave. “We probably experiment more with different styles now than I ever did as a homebrewer. Then I was gen-



Photo courtesy of Chris Lewis

Chris Lewis brews a lot of wild ales at Dead End Brew Machine in Glasgow. Here, Chris adds a 4-year-old *Brettanomyces* culture he developed in secondary to a cherry saison aged in Pinot Noir and Chardonnay barrels. “It started life as a mix of bottle dregs and then yeast/Brett (and probably bacteria) from pineapple skins and Scottish raspberries. Very much bootleg biology, and re-pitching this blend with fresh *Saccharomyces* each time.”



Photo courtesy of Paul Gibson

Paul Gibson started Campervan Brewery brewing on a portable 13-gallon (50-L) Brewmeister system that he brought to beer festivals in his 1973 Type 2 Volkswagen camper. These days he leaves the VW camper parked in front of his production brewery in Leith, Edinburgh.

erally focused more on nailing down techniques and processes and *how* to brew rather than *what* to brew. When you have zero experience of all-grain brewing, the *how* feels more important than the *what* initially.”

So the second trend of Scottish homebrew into commercial brewing — if we are to list them — would be that experimentation doesn’t come at the expense of quality. Studying the craft is every bit as important. Paul Gibson of Campervan Brewery agrees, having been through a similar *Eureka* moment during his homebrew days. “As I tried more beers in bars, I could identify faults or off-flavors and knew where the breweries had gone wrong in the process.”

“More friends, family, and work colleagues were telling me how great my beers were and that started me thinking about releasing some to the public. The final moment was a beer I bought in a bar from a well-known UK brewery and I knew that I could do much better.” That was the nudge Paul needed to go pro. Chris Lewis had made the leap that became Dead

End Brew Machine when a friend of his hosted a beer festival and demanded something from him to serve to his customers.

But in terms of gaining customers, up in Aberdeen Dave Grant had already managed to go one better. Before he and Co-Founder Dave McHardy officially launched Fierce Beer he was successfully selling 5-gallon (19-L) Corny kegs of his homebrew to local bars — as well as others as far away as Edinburgh and London. When patrons in a city with dozens of commercial breweries like your product, the big time isn’t far away.

So, what does this new generation of Scottish brewers think is the biggest take-home message they learned from honing their craft over their stovetops? Dave has a list ready to go. “Recipe development, water treatment, pH sensitivities. But mainly you can cheaply play around by adding adjuncts for minimal cost,” he says. “This is invaluable before heading towards the main kit (brewing system).”

Paul Fallen agrees that knowledge

is the best lesson. “If you understand what you’re doing and why you’re doing it the rest comes naturally. Also, homebrewing teaches you to source the best ingredients and be generous when you use them. If you use inferior quality malt or hops or you try and economize by cutting back on hop usage it will be obvious in the end product.”

As a counterpoint, Chris Lewis warns that homebrew has its limits when it comes to certain aspects of hitting the big time as a commercial brewer. “Starting and running a business has been good craic but a steep learning curve. There’s all the things that come with that like chasing payments and sales and marketing, which are all new.”

Dave Grant has an even longer list ready to go here. “You don’t really have a care when it is a hobby. Market research, sales, distribution, cash flow, funding, HR, QHSE (quality, health, safety, environment), marketing, IP protection . . . it is a long list.”

It may be a long list, but not one





## Homebrewing in Scotland

The rise of craft beer and breweries in Scotland over the last decade has increased interest in ingredients and the brewing process, which inevitably leads many people to try their hand at making their own beer. Homebrewing in Scotland predates the craft beer revolution, however.

In 1997, in a pub at Balerno, a small village outside Edinburgh, the inaugural meeting of the Scottish Craft Brewers was held. The organization was established with the aim of furthering the development of craft and homebrewing across Scotland through regular meetings and events.

Over the subsequent 22 years the club has grown and developed with the times and brewing trends, but fundamentally the original aim to promote the craft of brewing and provide support and camaraderie to Scottish homebrewers remains the same. One measure of the club's success is the significant number of current and former members who now work professionally in the Scottish brewing industry. Recognizing this, in recent years the club has been working closely with a German initiative – The YEAST Project – to provide work placements for brewing apprentices from Bavaria in Scottish breweries. Working in breweries that are not bound by the strict Reinheitsgebot laws is often a novel experience for the students, and similarly a number of club members have had the opportunity for return visits to Germany to learn more about

Bavarian brewing.

The largest event organized by the club each year is the annual Scottish Craft Brewers competition, one of the only Scottish competitions certified by the Beer Judge Certification Program. Reflecting the growth in popularity of homebrewing, both in Scotland and the rest of the world, recent years have seen a rise in the number and diversity of entrants. What was once primarily a Scottish affair now receives entries from the rest of the United Kingdom, Europe, and even the United States. This year the beer that won Best in Show was a foreign extra stout from Denmark.

The average home in the UK has less than half the floor space of the US (818 vs. 1,948 sq-ft) and in the two biggest Scottish cities, Edinburgh and Glasgow, between two thirds and three quarters of the population live in flats. In short, space is at a premium and the opportunities for a dedicated brewing area is limited. As a result, many brewers brew in their kitchens, with equipment setups that can be efficiently packed away when not in use. Traditional three-tier systems remain popular, however inevitably the growth of all-in-one electric systems such as the Grainfather has been rapid given these space constraints, and there is a growing interest in brew-in-a-bag in Scotland for similar reasons.

Traditional Scottish ales are brown, malty beers with limited hop characteristics, primarily distinguished by

strength. Unfortunately, even in Scotland, with a few notable exceptions, high-quality commercial examples of these classic styles are increasingly rare, so often brewing them at home is the only reliable way to ensure a steady supply. The Scottish Craft Brewers competition varies its categories each year, but there is always at least one space reserved for one of the Scottish styles. Winning this category carries an extra cachet of preserving an important brewing tradition.

Similar to craft brewers, homebrewers do not limit themselves to the classic Scottish styles, however. At the most recent Scottish Craft Brewers meeting there were 22 different beers brought along by members, including a fruited Gose, English bitter, Belgian saison, American brown ale, imperial stout, and a German doppelbock. Heavily hopped beers with American and other New World hop varieties are as popular in Scotland as elsewhere in the UK, although the relative cost of these imported ingredients can make brewing them an expensive proposition. Availability and freshness of hops is a key concern as well, with regular debate over which supplier has the most recent harvest and the most robust storage regime. There is also an increasing interest in sour beers that mirrors the growing availability of commercially brewed examples, as well as experiments with barrel aging and unusual adjuncts.

– Harry Kirkham

that is putting off brewers from stepping up. According to this author's anecdotal evidence, more breweries have opened up in Scotland this decade than in the previous thirty years combined. There are now well over 150 production and small-scale contract brewers north of Hadrian's Wall, with 40 of them launching their beers in 2014/2015 alone (including Fierce Beer, Campervan, and Fallen Brewing, who ceased contract brewing that year and opened their own facility).

## THE CLASSICS

Scottish brewing is an industry that respects its history, but there are only four producers still currently brewing who were doing so prior to 1980. Edinburgh's Caledonian Brewery, Glasgow's Wellpark (the home of Tennent's Lager), the time-locked Traquair House Brewery in the Scottish Borders, and the oldest of them all; Belhaven Brewery in Dunbar, where brewing commenced in 1719 (although it is now owned by England's Greene King).

Three of those four have portfolios that revolve around that quintessential Scottish brewing idiosyncrasy — the Shilling System — with tiers based on the price each cask would fetch in old money. The stronger the beer, the costlier it would be (some things never change) leaving beers known simply by their price tags, from 42/- (42 shillings) through 54/-, 70/-, 80/- and beyond.

Today Belhaven still produces an 80/-; Caledonian recently renamed their 80/- "Edinburgh Castle" and Traquair push their wooden mash tun to the limit with their 9.5% ABV 160/- ale. But times have already changed. Equally on point is the fact that three of those four also now carry a "craft" range — either stated explicitly as per Belhaven and Caledonian, or in a more subtle manner.

In 2014, the C&C Group, owners of Tennent's Lager, joined forces with William Bros Brewing Company to launch Drygate; a Glasgow-based craft brewery, taproom, and restaurant in the shadow of their vast lager brewhouse. Situated inside a

converted box factory, this 24-HL (634-gallon) brewhouse creates dozens of different beers every year, with a core range including a 4.7% ABV apple ale where First Gold and Savinjski Golding hops are complemented by the addition of apple juice.

## THE INFLUENCE OF BREWDOG

Craft beer has arrived in Scotland. The rise of its most successful advocate, BrewDog, is testament to that. Since their arrival in the spring of 2007, Co-Founders James Watt and Martin Dickie have built their Aberdeenshire concern into a behemoth, becoming the largest craft brewery in Europe and employing 1,500 people. But like the other breweries in this article, it all began with homebrew.

James and Martin created the first BrewDog recipes in a garage belonging to Martin's mother, using old Cascade hops in an attempt to recreate Sierra Nevada Pale Ale (surely not being alone in starting their homebrew adventures with that aim). In early 2016 the pair — now exporting their beer to over 60 countries around the world — released every BrewDog recipe to the homebrewing community for free.

This inimitable way of doing business is another standout point of the

Scottish brewing scene. Alongside breweries that specialize in Belgian or German-style beers, there are others that have — like BrewDog — a truly unexpected perspective. One of those is Paul Gibson and his aforementioned Campervan Brewery. When he started out, Paul did so with a unique concept — a 1973 Type 2 Volkswagen camper. Brewing on a portable 13-gallon (50-L) Brewmeister system, he literally took to the road.

"I've been to so many festivals and the breweries are there with their white tents, you know, they all look the same," he explained to me back in 2015 when we first met. "I can bring the brewkit along and actually do a live brew; and the people there can get a true feel for how natural a product it is. I can actually get some crowd participation involved." These days the VW camper is parked in front of his production brewery in Leith, Edinburgh, but that distinctiveness remains.

## LOGISTICAL HEADACHES

For many breweries in Scotland, uniqueness manifests itself in the way that nearly 16 million people discovered in the year to 2018 (according to tourism numbers from the Office for National Statistics) — the landscape and geography of the country. Over half a million visitors take the



*Fallen Brewing in Stirlingshire is renowned for their quality beers, which Founder Paul Fallen credits to nailing down brewing techniques as a homebrewer.*

Photo courtesy of Paul Fallen





# SCOTTISH CLONES

## CROMARTY BREWING CO.'S PIBROCH WEE HEAVY CLONE



(5 gallons/19 L, all-grain)  
OG = 1.072 FG = 1.018  
IBU = 20 SRM = 20 ABV = 7.2%

*This wee heavy showcases a complex malt backbone with a touch of smoked malt to fill out the mouthfeel and increase the overall depth of character.*

### INGREDIENTS

11 lbs. (5 kg) Simpsons Maris Otter pale ale malt  
1.78 lbs. (0.8 kg) Weyermann Beechwood smoked malt  
0.56 lb. (0.25 kg) Weyermann melanoidin malt (20 °L)  
0.56 lb. (0.25 kg) Simpsons Golden Naked Oats® malt  
0.37 lb. (0.17 kg) Simpsons crystal malt (60 °L)  
0.37 lb. (0.17 kg) Simpsons crystal malt (120 °L)  
0.21 lb. (0.1 kg) Simpsons roasted barley (450 °L)  
1.5 AAU Fuggle hops (120 min.) (0.3 oz./8.5 g at 5% alpha acids)  
1.5 AAU Fuggle hops (45 min.) (0.3 oz./8.5 g at 5% alpha acids)  
7 AAU Fuggle hops (10 min.) (1.4 oz./40 g at 5% alpha acids)  
½ Whirlfloc tablet (10 min.)  
White Labs WLP028 (Edinburgh Scottish Ale) or Wyeast 1728  
(Scottish Ale) or LalBrew Nottingham yeast  
⅔ cup corn sugar (if priming)

### STEP BY STEP

Use soft or low mineral content water to help accentuate the malty aspects of this beer. With a 1.2 qts./lb. (2.5 L/kg) water-to-grist ratio, target a mash temperature of 155 °F (68 °C). Perform a single infusion mash for 60 minutes or until proper enzymatic conversion has occurred. Sparge with 170 °F (76 °C) water to collect 8.4 gallons (31.8 L) of wort.

Boil for 120 minutes, adding hops and fining agents as indicated. At flameout, rapidly chill the wort to 61 °F (16 °C) and transfer to the primary fermenter. Aerate thoroughly and pitch plenty of healthy yeast. Ferment at 63 °F (17 °C) until terminal gravity of 1.018 is reached, usually within 10 to 14 days. Once fermentation is complete, drop beer temperature to 50 °F (10 °C) and hold for 5 days. Then drop temperature to 39 °F (4 °C) and lager for a minimum of 3 weeks.

Keg or bottle, targeting 2.2 volumes of CO<sub>2</sub>.

### TIPS FOR SUCCESS:

Use high quality, fresh malts along with sufficient aging time and low fermentation temperatures to develop the sweet, smooth, and balanced maltiness desired in this beer.

## CROMARTY BREWING CO.'S PIBROCH WEE HEAVY CLONE



(5 gallons/19 L, partial mash)  
OG = 1.072 FG = 1.018  
IBU = 20 SRM = 18 ABV = 7.2%

### INGREDIENTS

2.7 lbs. (1.22 kg) Simpsons Maris Otter pale malt  
4.6 lbs. (2.1 kg) Briess CBW® pale ale dried malt extract  
1.78 lbs. (0.8 kg) Weyermann Beechwood smoked malt  
0.56 lb. (0.25 kg) Weyermann melanoidin malt (20 °L)  
0.56 lb. (0.25 kg) Simpsons Golden Naked Oats® malt  
0.37 lb. (0.17 kg) Simpsons crystal malt (60 °L)  
0.37 lb. (0.17 kg) Simpsons crystal malt (120 °L)  
0.21 lb. (0.1 kg) Simpsons roasted barley (450 °L)  
1.5 AAU Fuggle hops (120 min.) (0.3 oz./8.5 g at 5% alpha acids)  
1.5 AAU Fuggle hops (45 min.) (0.3 oz./8.5 g at 5% alpha acids)  
7 AAU Fuggle hops (10 min.) (1.4 oz./40 g at 5% alpha acids)  
½ Whirlfloc tablet (10 min.)  
White Labs WLP028 (Edinburgh Scottish Ale) or Wyeast 1728  
(Scottish Ale) or LalBrew Nottingham yeast  
⅔ cup corn sugar (if priming)

### STEP BY STEP

Heat 2 gallons (7.6 L) of water to 168 °F (76 °C) and add a steeping bag with the crushed grains. Submerge the bag and stir grains to ensure sufficient hydration. Mash for 60 minutes targeting a mash temperature of 155 °F (68 °C). Remove bag from pot and sparge with 170 °F (76 °C) water to collect 4 gallons (15 L) of wort.

Boil for 120 minutes, adding hops and Whirlfloc as indicated. Add the dried malt extract in the last 10 minutes of the boil. Follow the remainder of the all-grain instructions, making sure to top fermenter off to 5 gallons (19 L) prior to fermentation.





# SCOTTISH CLONES

## DEAD END BREW MACHINE'S CURTIS THE DESTROYER CLONE



(5 gallons/19 L, all-grain)  
OG = 1.106 FG = 1.033  
IBU = 55 SRM = 14 ABV = 9.6%

*This big barleywine is boiled for two and a half hours to contribute toffee and caramel notes and is fermented with a custom blend of London III and Burlington yeast and aged in Jamaican rum barrels.*

### INGREDIENTS

19.3 lbs. (8.75 kg) Crisp Maris Otter pale ale malt  
1.46 lbs. (0.66 kg) Crisp flaked torrefied barley  
0.78 lbs. (0.35 kg) Chateau Belgian biscuit malt  
3 AAU Magnum hops (60 min.)  
(0.3 oz./8.5 g at 10% alpha acids)  
2.6 AAU Challenger hops (60 min.)  
(0.3 oz./8.5 g at 8.8% alpha acids)  
8.8 AAU Challenger hops (30 min.)  
(1 oz./28 g at 8.8% alpha acids)  
8.4 AAU Pioneer hops (30 min.)  
(1 oz./28 g at 8.4% alpha acids)  
1.5 oz. (43 g) Challenger hops (whirlpool)  
1.5 oz. (43 g) Pioneer hops (whirlpool)  
½ Whirlfloc tablet (10 min.)  
White Labs WLP095 (Burlington Ale) yeast  
Wyeast 1318 (London Ale III) yeast  
3.5 oz. (100 g) medium+ toasted oak cubes soaked in  
Jamaican rum  
⅔ cup corn sugar (if priming)

### STEP BY STEP

Target your brewing water at approximately 70 ppm for chlorides and 45 ppm sulfate. This can be achieved using reverse osmosis (RO) water and adding 0.02 oz./gal (0.15 g/L) CaCl<sub>2</sub> and 0.01 oz./gal (0.08 g/L) gypsum.

A step mash process is employed for maximum fermentability. Dough-in at a 1.1 qts./lb. (2.3 L/kg) ratio using 5.9 gallons (22.3 L) of water for the mash targeting an initial temperature of 143 °F (62 °C). Rest for 30 minutes then raise temperature to 149 °F (65 °C) and hold for another 30 minutes. For the last step of the mash, raise temperature to 162 °F (72 °C) and hold for 15 minutes. In lieu of performing a step mash, a single infusion mash can be employed with a target temperature of 148 °F (64 °C). Hold at this temperature for 90 minutes to maximize enzymatic conversion.

Sparge using 167 °F (75 °C) water to collect 9 gallons (34 L) of wort. Total boil time is 150 minutes. Add hops and Whirlfloc as indicated. Add the whirlpool hops at flameout, give the wort a vigorous stir, and then cover and let rest for 15 minutes.

Chill the wort to 63 °F (17 °C) and transfer to primary fermenter. Aerate thoroughly prior to pitching yeast blend. Allow fermentation temperatures to slowly rise by 1–2 °F (1 °C) per day up to a maximum of 73 °F (23 °C) to ensure complete fermentation and minimization of fusel alcohol production.

Once primary fermentation is complete (approximately two weeks), rack beer to a CO<sub>2</sub>-purged first use rum barrel or a clean and sanitized secondary fermenter. If using a secondary fermenter, add rum-soaked oak cubes and age until a balanced rum character is achieved. Force carbonate to 1.8 volumes of CO<sub>2</sub> or prime and bottle. Additional aging will contribute a pleasant Sherry-like character to the beer.

### TIPS FOR SUCCESS:

Hitting the starting gravity for this beer has a dependency on your boil evaporation rate. This recipe assumes an evaporation rate of 15% per hour. Depending on the evaporation rate of your system, you may need to adjust the amount of wort collected to hit the target starting gravity with the prescribed boil time.

This is a big beer that requires plenty of healthy yeast to ensure complete fermentation. It is recommended to make a single 3-qt (3-L) starter using one pack of WLP095 and one pack of Wyeast 1318. Pitch yeast when yeast activity is strong

### PARTIAL MASH VERSION:

To brew a partial mash version of Dead End Brew Machine's Curtis The Destroyer clone reduce the Crisp® Maris Otter pale ale malt to 8.5 lbs. (3.86 kg) and add 6 lbs. (2.72 kg) Briess CBW® pale ale dried malt extract. Heat 3.2 gallons (12.1 L) of water to 161 °F (72 °C) and submerge large steeping bag containing the crushed grains into water. Stir grains to ensure sufficient hydration and mash for 90 minutes targeting a mash temperature of 148 °F (64 °C). Remove bag from pot and sparge with 170 °F (77 °C) water to collect a total of 4.25 gallons (16 L) of wort.

Boil wort for 60 minutes, adding hops and Whirlfloc according to the schedule. Add the dried malt extract in the last 10 minutes of the boil.

Follow the remainder of the all-grain recipe instructions, being sure to top your fermenter off to 5 gallons (19 L) prior to fermentation.







# SCOTTISH CLONES

## FYNE ALES' JARL CLONE

(5 gallons/19 L, all-grain)  
OG = 1.038 FG = 1.009  
IBU = 38 SRM = 4 ABV = 3.8%



*Jarl is a simple recipe designed to showcase the grapefruit and lychee character of Citra® hops in a very sessionable pale ale. The difficulty lies in managing the brewing process in order to strike the right balance between the hops and malt. Fyne Ales' flagship session ale is best enjoyed by the pint with friends.*

### INGREDIENTS

6.92 lbs. (3.13 kg) Muntons extra pale ale malt  
0.77 lb. (0.35 kg) Muntons torrified wheat  
1.4 AAU Citra® leaf hops (60 min.)  
(0.1 oz./3 g at 14.3% alpha acids)  
1.4 AAU Citra® leaf hops (30 min.)  
(0.1 oz./3 g at 14.3% alpha acids)  
2.3 oz. (65 g) Citra® leaf hops (0 min.)  
½ Whirlfloc tablet (10 min.)  
SafAle US-05 or Mangrove Jack's M44 (US West Coast) yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

Using water with low mineral content will provide the best results. Fyne Ales treats their reverse osmosis water with Murphy & Sons DWB at a ratio of 0.1 oz./gallon (0.7 g/L) of collected wort (see their website if you want to find more information on DWB).

Using a 1.1 qts./lb. (2.3 L/kg) water-to-grist ratio, perform a single infusion mash with a target temperature of 153.5 °F (67.5 °C) for 60 minutes or until proper enzymatic conversion has occurred. Batch or fly sparge with 168 °F (76 °C) water to collect 7 gallons (26.5 L) of wort in the kettle.

Boil for 60 minutes, adding hops and fining agent as indicated. At flameout, add the last hop addition and stir vigorously to create a whirlpool. Rest for 20 minutes then rapidly chill the wort to 63 °F (17 °C) and transfer to primary fermenter. Aerate thoroughly and pitch plenty of healthy yeast.

Allow fermentation temperatures to free rise to a maximum of 73 °F (23 °C). Hold fermentation at 73 °F (23 °C) until terminal gravity of 1.009 is reached, usually within 5 to 7 days. Chill beer at a rate of 2 °F (1 °C) per hour until reaching 59 °F (15 °C) and then hold at that temperature for 24 hours. Resume chilling at a rate of 2 °F (1 °C) per hour until attaining 50 °F (10 °C) if cask conditioning or 32 °F (0 °C) if kegging or bottling.

Rack beer off yeast into a cask/keg for serving targeting 2.4 volumes of CO<sub>2</sub> or prime and bottle, leaving the bottles at 70–75 °F (21–24 °C) for two weeks to properly condition.

## FYNE ALES' JARL CLONE

(5 gallons/19 L, partial mash)  
OG = 1.038 FG = 1.009  
IBU = 38 SRM = 4 ABV = 3.8%



### INGREDIENTS

1 lb. (0.45 kg) Muntons extra pale ale malt  
3.3 lbs. (1.5 kg) Briess CBW® pale ale dried malt extract  
0.77 lb. (0.35 kg) Muntons torrified wheat  
1.4 AAU Citra® leaf hops (60 min.)  
(0.1 oz./3 g at 14.3% alpha acids)  
1.4 AAU Citra® leaf hops (30 min.)  
(0.1 oz./3 g at 14.3% alpha acids)  
2.3 oz. (65 g) Citra® leaf hops (0 min.)  
½ Whirlfloc tablet (10 min.)  
SafAle US-05 or Mangrove Jack's M44 (US West Coast) yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

Heat 1.1 gallons (4.2 L) of water to 167 °F (75 °C) and place large steeping bag containing the crushed grains into a 5-gallon (19-L) pot. Submerge the bag and stir grains to ensure sufficient hydration. Mash for 60 minutes targeting a mash temperature of 153.5 °F (67.5 °C). Remove bag from pot and sparge with 168 °F (76 °C) water to collect 3 gallons (11.4 L) of wort.

Boil for 60 minutes, adding hops and fining agent as indicated. Add the dried malt extract in the last 10 minutes of the boil. At flameout, add the last hop addition and stir vigorously to create a whirlpool. Rest for 20 minutes then rapidly chill the wort to 63 °F (17 °C) and transfer to primary fermenter. Top off wort with pre-chilled water to bring volume up to 5 gallons (19 L). Aerate thoroughly and pitch plenty of healthy yeast.

Follow the fermentation and packaging instructions described in the all-grain recipe.





# SCOTTISH CLONES

## SIX DEGREES NORTH BREWING CO.'S HOP CLASSIC CLONE



(5 gallons/19 L, all-grain)  
OG = 1.055 FG = 1.004  
IBU = 66 SRM = 3 ABV = 6.6%

*Hop Classic is a full-flavored Belgian IPA with bitterness well-integrated in true Belgian style, featuring a pleasant kick at the end. Super refreshing on the palate with apricot, citrus, and floral notes. Inspired by De Ranke XX Bitter, Hop Classic was created as a homage to the nouveau classic of Belgium brewing. It is a simple recipe but very complex beer with the malt bill allowing the yeast and classic noble hop character to shine through.*

### INGREDIENTS

10.5 lbs. (4.75 kg) Bairds Pilsen malt  
0.3 lb. (0.14 kg) cane sugar  
11.8 AAU Magnum leaf hops (first wort hop)  
(1 oz./28 g at 11.8% alpha acids)  
5.9 AAU Magnum leaf hops (35 min.)  
(0.5 oz./14 g at 11.8% alpha acids)  
1 AAU Hallertau Mittelfrüh leaf hops (35 min.)  
(0.3 oz./8.5 g at 2.9% alpha acids)  
2 AAU Hallertau Mittelfrüh leaf hops (15 min.)  
(0.7 oz./20 g at 2.9% alpha acids)  
0.8 oz. (23 g) Hallertau Mittelfrüh leaf hops (0 min.)  
½ Whirlfloc tablet (10 min.)  
White Labs WLP570 (Belgian Golden Ale) or Imperial Yeast B45  
(Gnome) or LalBrew Abbaye yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

With a 1.2 qts./lb. (2.5 L/kg) water-to-grist ratio, conduct a protein rest at 131 °F (55 °C), holding for 10 minutes. Raise the mash temperature to 145 °F (63 °C) and hold for 40 minutes for beta amylase rest. Perform final alpha amylase rest of the step mash by raising the temperature to 161 °F (72 °C) for 10 minutes or until enzymatic conversion is complete. Batch or fly sparge with 176 °F (80 °C) water to collect 7 gallons (26.5L) of wort in the kettle.

Boil for 60 minutes, adding hops and fining agent as indicated. Rapidly chill the wort at flameout to 65 °F (18 °C) and transfer to primary fermenter. Aerate thoroughly and pitch plenty of healthy yeast. Ferment at 70 °F (21 °C) until terminal gravity of 1.004 is reached, usually within 7 to 10 days. Crash cool the beer to 39 °F (4 °C) and lager for 4 weeks.

Rack beer off of the yeast into a keg and force carbonate targeting 2.6 volumes of CO<sub>2</sub> or prime and bottle condition, leaving the bottles at 70–75 °F (21–24 °C) for two weeks to properly condition.

## SIX DEGREES NORTH BREWING CO.'S HOP CLASSIC CLONE



(5 gallons/19 L, extract only)  
OG = 1.055 FG = 1.004  
IBU = 66 SRM = 3 ABV = 6.6%

### INGREDIENTS

5.8 lbs. (2.6 kg) Briess CBW® Pilsen dried malt extract  
0.3 lb. (0.14 kg) cane sugar  
11.8 AAU Magnum leaf hops (first wort hop)  
(1 oz./28 g at 11.8% alpha acids)  
5.9 AAU Magnum leaf hops (35 min.)  
(0.5 oz./14 g at 11.8% alpha acids)  
1 AAU Hallertau Mittelfrüh leaf hops (35 min.)  
(0.3 oz./8.5 g at 2.9% alpha acids)  
2 AAU Hallertau Mittelfrüh leaf hops (15 min.)  
(0.7 oz./20 g at 2.9% alpha acids)  
0.8 oz. (23 g) Hallertau Mittelfrüh leaf hops (0 min.)  
½ Whirlfloc tablet (10 min.)  
White Labs WLP570 (Belgian Golden Ale) or Imperial Yeast B45 (Gnome)  
or LalBrew Abbaye yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

Heat 2.5 gallons (9.5 L) of water in a 5-gallon (19-L) pot to 150 °F (66 °C) and remove from heat. Add 3.3 lbs. (1.5 kg) of the dried malt extract and all of the cane sugar. Stir well, ensuring all sugar and malt extract is completely dissolved.

Boil for 60 minutes, adding hops and fining agent as indicated. Add the remaining dried malt extract in the last 10 minutes of the boil.

Rapidly chill the wort at flameout to 65 °F (18 °C) and transfer to primary fermenter. Top off wort with pre-chilled water to bring volume up to 5 gallons (19 L). Aerate thoroughly and pitch plenty of healthy yeast.

Follow the fermentation and packaging instructions described in the all-grain recipe.







# SCOTTISH CLONES

## STEWART BREWING CO.'S STEWART'S 80/- CLONE

(5 gallons/19 L, all-grain)  
OG = 1.043 FG = 1.009  
IBU = 28 SRM = 18 ABV = 4.4%



*Stewart's 80/- is a full-bodied, full-flavored, auburn-colored classic Scottish heavy exhibiting a rich malty, dried fruit character and a smooth, creamy texture. Originally brewed for the world-famous Athletic Arms (Diggers) in Edinburgh in 2012, Stewart's 80/- has continued to grow in popularity enabling the beer to be enjoyed in pubs across Scotland.*

### INGREDIENTS

6.5 lbs. (3 kg) Muntons Maris Otter pale ale malt  
0.85 lb. (0.39 kg) Crisp wheat malt  
0.6 lb. (0.27 kg) Simpsons malted oats  
0.56 lb. (0.25 kg) Simpsons crystal medium malt (65 °L)  
0.3 lb. (0.14 kg) Simpsons dark crystal malt (100 °L)  
1.38 oz. (39 g) Simpsons chocolate malt (440 °L)  
0.78 oz. (22 g) Simpsons roasted barley malt (550 °L)  
5.8 AAU Challenger hops (60 min.)  
(0.7 oz./20 g at 8.3% alpha acids)  
0.25 oz. (7 g) Challenger hops (0 min.)  
0.25 oz. (7 g) Polish Lubelski hops (0 min.)  
½ Whirlfloc tablet (10 min.)  
LalBrew Nottingham or SafAle S-04 yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

The primary mineral composition of the water used in this beer is Ca – 100 ppm, Mg – 2 ppm, Na – 28 ppm, Cl – 107 ppm, and SO<sub>4</sub> – 57 ppm. To approximate Stewart's water profile using RO water, add 0.01 oz./gal (0.4 g/L) gypsum, 0.01 oz./gal (0.05 g/L) NaCl, and 0.02 oz./gal (0.2 g/L) CaCl<sub>2</sub>.

With a 1.2 qts./lb. (2.5 L/kg) water-to-grist ratio, target a mash temperature of 151 °F (66 °C). Perform a single infusion mash for 60 minutes or until proper enzymatic conversion has occurred. Batch or fly sparge with 164 °F (73.5 °C) water to collect 7 gallons (26.5 L) of wort in the kettle.

Boil for 60 minutes, adding hops and fining agent as indicated. At flameout, rapidly chill the wort to 64 °F (18 °C) and transfer to primary fermenter. Aerate thoroughly and pitch plenty of healthy yeast. Ferment at 66 °F (19 °C) until terminal gravity of 1.009 is reached, usually within 5 to 7 days.

Rack beer off yeast into a cask/keg for serving targeting 2.3 volumes of CO<sub>2</sub> or prime and bottle leaving the bottles at 70–75 °F (21–24 °C) for two weeks to properly condition.

## STEWART BREWING CO.'S STEWART'S 80/- CLONE

(5 gallons/19 L, partial mash)  
OG = 1.043 FG = 1.009  
IBU = 28 SRM = 18 ABV = 4.4%



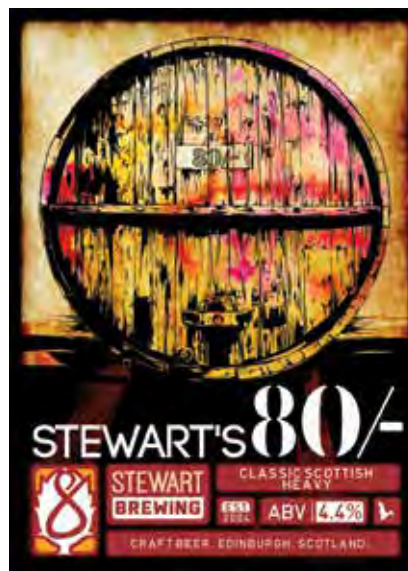
### INGREDIENTS

2.4 lbs. (1.1 kg) Briess CBW® pale ale dried malt extract  
2 lbs. (0.91 kg) Muntons Maris Otter pale ale malt  
0.85 lb. (0.39 kg) Crisp wheat malt  
0.6 lb. (0.27 kg) Simpsons malted oats  
0.56 lb. (0.25 kg) Simpsons crystal medium malt  
0.3 lb. (0.14 kg) Simpsons dark crystal malt  
1.38 oz. (39 g) Simpsons chocolate malt (440 °L)  
0.78 oz. (22 g) Simpsons roasted barley malt (550 °L)  
5.8 AAU Challenger hops (60 min.)  
(0.7 oz./20 g at 8.3% alpha acids)  
0.25 oz. (7 g) Challenger hops (0 min.)  
0.25 oz. (7 g) Polish Lubelski hops (0 min.)  
½ Whirlfloc tablet (10 min.)  
LalBrew Nottingham or SafAle S-04 yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

Heat 2 gallons (7.6 L) of water to 160 °F (71 °C) and submerge crushed grains in a steeping bag. Stir grains to ensure sufficient hydration. Mash for 60 minutes targeting a mash temperature of 151 °F (66 °C). Remove bag from pot and sparge with 170 °F (77 °C) water to collect 3 gallons (11.4 L) of wort.

Boil for 60 minutes, adding hops and Whirlfloc as indicated. Add the dried malt extract in the last 10 minutes of the boil. Follow the remainder of the all-grain instructions, making sure to top fermenter off to 5 gallons (19 L) prior to fermentation.





*Dave Grant (right) Co-Founded Fierce Beer in Aberdeen with David McHardy (left) after successfully selling 5-gallon (19-L) Corny kegs of his homebrew to local bars. Fierce Beer brews everything from lagers to a wide variety of ales and sours.*

ankle-numbing flight from North America each year to find out what we Scots already know — this is a beautiful part of the world.

But picture-postcard vistas don't make for easy business (unless your business is tourism. Or postcards.). Brewers in Scotland often have to deal with everything from quirks to full-scale logistical nightmares when it comes to simply getting ingredients to them, or their beers to you and me. And no section of the brewing industry here feels it more than Scotland's island breweries.

There are around a dozen production breweries based on the near-800 islands that cluster around the Scottish mainland. And some are seriously remote. None more so than the UK's most northerly, the Valhalla Brewery in Unst, Shetland. Their first brew arrived in December 1997 and each comes with what founder Sonny Priest describes as "logistical headaches" based on him operating on the furthest-flung inhabited island in the country, nearer to Norway than Edinburgh (search Google Maps for "Unst" and then zoom out. And keep zooming. You'll see.).

A little closer to the mainland, but

no less challenging a location, are the Orkney Islands. An hour's ferry from the rest of Scotland, this archipelago is commonly battered by the Atlantic Ocean and the prevailing wind; the saying goes "Orkney summers are short and bright and the winters are long and dark." Of course, dark winters need lubrication (as do bright summers).

Helping fulfill that role is the Swannay Brewery, which emerged in 2004 when founder Rob Hill was let go from the then sole brewery on the island and decided to start up for himself. Since joined by his eldest son, Lewis, and a small but dedicated team, Swannay (they rebranded from Highland Brewing Company in 2015 to better reflect their island location) is arguably — if not definitively — the most-awarded Scottish brewery there is.

And all from a converted farmhouse 300 miles north of the Scottish capital. "Nothing happens quickly," says Lewis Hill when questioned about the unique challenges of operating a brewery on an exposed and rugged island surrounded by vertical cliffs. "We need to be well-organized and factor in weather delays. Transport is a huge factor and one of our biggest

costs. Materials in, beer out, containers back in."

This to-and-fro becomes a game of cat-and-mouse thanks to the unpredictability of the Scottish weather, and it is a problem for all island breweries in the country. Another, the Colonsay Brewery, are over two hours by ship from the mainland. When the weather turns and the ferries are cancelled, as often happens, the beer stays where it is. A shame for the island's 120-strong population (the brewery employs ten percent of the island's workforce).

Isolation has its advantages though. As Lewis Hill explains, "The other side of the coin (in terms of their island location) is we have a loyal and strong customer base here on the island. Most places have a Scapa Special cask line and volumes are consistent. Also there are more and more keg lines where volume is increasing nicely."

Scapa Special is Swannay's flagship and the first beer Rob Hill ever brewed under his own steam. A multi-time Champion Beer of Scotland, this 4.4% ABV pale ale contains a mix of UK, German, and US hops and still accounts for a third of the beer Swannay



brews today. But in 2017, the brewery embarked in a different, yet complementary, direction — a range of modern-leaning beers packaged in cans; the “Mutiny” range.

“They were launched with the goal of brewing beers with a bit more of a modern edge,” continues Lewis. “Hop-forward, with alternative ingredients and modern branding. The main driver was the established following our core beers have; not wanting to dilute that.” So even in the outer lying islands of the country, craft beer has taken hold (on Colonsay too, who rebranded in 2015 after hiring a marketing agency).

### HOMEBREWING FOOTHOLD

But even if change happens, one of the endearing — and enduring — threads that holds Scotland together is remembering where you come from; every descendent of Scottish ancestry in North America can attest to that. Brewers over here are also better at that than most, whether they have been influenced by the craft beer phenomenon or not, thanks to their shared backstory in homebrewing.

This rite of passage is one that in recent years has spawned another

trend — the commercial homebrew setup. In 2014 Stewart Brewing, based in Loanhead on the outskirts of Edinburgh, introduced the “Craft Beer Kitchen,” a brew your own destination with three 29-gallon (110-L) kettles for hire by the day for anyone wanting to create their own beer, guided from start to finish.

In the five years since, over 2,000 groups have done just that, and front and center in them getting the beer they want is Craft Beer Kitchen Manager James Hardacre. “We can brew up to seven times a day,” he says. “Customer brews are partial mash (malt extract with pre-steeped specialty grains) with the entire brew taking around 2½ hours.”

“We can do everything from pale lagers to stouts. We talk through water chemistry, malting, we usually have a dozen or more hops from around the world to choose from. Finally we discuss yeast and have five yeast strains to choose from. The chat is tailored to each group based on experience; some people come in knowing very little about beer, some groups are homebrewers or regulars, so we can drill down into as much detail as required.”

The group returns to bottle or cask their finished beer in three weeks (if an ale) or seven (if a lager). So for the definitive survey on what the people of Scotland are drinking in 2019, what are the most commonly asked-for styles? “We brew a lot of golden ales and IPAs, I’d say that’s the majority. It’s not unusual to have a lager or hefeweizen group. Saisons and Belgian styles are less popular. Stouts and 80/- we get only very occasionally.”

So has the craft beer surge failed to make it to the wedding-favors and birthday-gift brewers of Scotland? Not on your life. “New England IPAs have become more popular in the last year,” he concludes. “We have a low-flocculating yeast in now for those. In recent months I’ve brewed with oysters, added chilies, sumac, mango, blackcurrant, passion fruit, every type of citrus zest, tea, and Japanese sansho berries to brews.”


So from homebrew to commercial and back to commercial homebrew — as the history of Scottish brewing is respected, it is done so with one eye on the horizon and the new trends arriving on our shores. But this Scottish beer drinker wouldn’t want it any other way. 



Photo courtesy of Swannay Brewery

On the Orkney Islands, 300 miles north of the Scottish capital and surrounded by vertical cliffs, is Swannay Brewery — one of the most-awarded Scottish breweries. “Nothing happens quickly,” says Lewis Hill regarding the unique challenges of operating a brewery off the mainland.

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# The intersection of *Wine and Beer*

*M*any brewers are first drawn to homebrewing for the creativity and experimentation involved, and one of the easiest ways to add a new dimension to an already-understood style of beer is adding fruit. If one looks at the evolution of the craft beer market, this seems to be an instinct brewers turn to again and again. Yet grapes, despite being the basis for another alcoholic beverage that I would describe as at least *relatively* popular, historically speaking, have never seemed to find their way into beer as often as one might expect.

Perhaps this omission was, in a roundabout way, a sort of showing of respect. Wine's pedigree needs no real explanation, and beer and wine have always felt — for better or worse — as if they've been designated their own particular cultural cachet. But as craft brewers have demonstrated that beer can match wine for sophistication, it was perhaps inevitable that the two beverages would unite in the fermenter as well.





# *Grapes & Grains*

by Derek Dellinger





*Co-fermenting crushed grapes (also called must) with your base beer to create a new-age beer-wine hybrid is a melding of the two beverages.*

## CO-FERMENTATION

The uptick of beer brewers experimenting with wine grapes in recent years seems to be tied to another rising trend in the wider world of fermentation: Co-fermentation. While the practice has begun to impact all types of fermentation, it was popularized in the wine industry. Historically, particularly in France's Rhône region, wine grapes were often simply gathered by the bunch, and rather than separating by variety, were fermented all together as a single field blend. Generally seen as an alternative to blending post-fermentation, the resulting co-fermented wine was prized for its uniquely melded character. But the practice can be extended beyond wine as well. Looking at the process in terms of beer fermenting alongside grapes, this may not seem like a drastic departure from simply adding fruit to beer in a secondary vessel, but the differences in timing and fermentation conditions add up to a richer, markedly varied character.

Co-fermentation is vital to properly representing the quality and unique characteristics of a wine grape, says Jeremy Grinkey, production manager at Bruery Terreux in Anaheim, California. An offshoot brand of The Bruery, Bruery Terreux specializes in wild ales, and has produced a wide spectrum of unorthodox experiments over the

years. Grinkey, who had previously worked in the wine industry, has overseen a wide variety of wine-beer hybrids during his time as production manager at Bruery Terreux.

"Wine grapes should be respected and used in a conscious manner," says Grinkey. "I was told long ago by a good friend to make what you like, so that's what I do. If I'm drinking a wine, say Syrah, for months and having a relationship studying that grape, then I tend to want to work with it. I'll start conceptualizing exactly what I think will need to be done to make that grape shine through the beer. I don't want a grape beer, I want a beer-wine hybrid and want that Syrah to be respected by the beer portion and I want it to be variably noticeable."

For Grinkey, it's his relationship with a particular grape that begins to shape his goals for a wine-beer hybrid — and he believes that relationship should begin as early in the process as possible. "We tend to contract our wine grapes and have a say in how it's farmed and when it's picked," Grinkey says. "Having some control of sugar, pH, and cropping is extremely important to making a quality product. We don't want to be lucky, we want to execute to the concept."

Of course, Bruery Terreux has access to resources that the average homebrewer does not — but

high-quality grapes can be found from vineyards outside of typical "wine regions" and in the case there isn't one within a drive from where you live, numerous suppliers sell grapes or pressed grape juice online. Spend a little time searching the internet and you should find a handful of suppliers who will ship fresh or frozen grapes, juice, concentrate, or puree (for more on using puree, see the sidebar on page 82). If you are lucky enough to live in a region with local wineries, then forming a relationship with a local winemaker is an excellent way to gain access to both information and quality fruit.

## SOURCING LOCAL GRAPES

I worked as Head Brewer of Kent Falls Brewing in Kent, Connecticut until summer 2018. During my four years there, we embraced the bounty of local agriculture in northwestern Connecticut at every opportunity. While we produced a wide variety of styles, wild ales and saisons were a focal point for our efforts, and the beers we felt were best able to capture the agricultural spirit of the brewery. We worked with farmers within a 50-mile radius of the brewery as frequently as possible, often heading out into the fields ourselves to harvest and get a hands-on sense of the fruit we'd be using and the place it came from. Rob Bollard, who worked alongside me as an As-

sistant Brewer for several years and has since taken over the role of Head Brewer, had connections with a local winery, Maywood, that was growing a wide variety of fruit in addition to several grape varieties.

I've always felt that beers are more memorable when there's a story behind them. When we realized that we had a close connection to a local winery, we began discussing how we could capture this relationship in a beer. For Bollard, many of these wine-beer hybrids produced at Kent Falls held a deeply personal significance.

"I spent a lot of summers working the property when I was younger," Bollard says. "I would spend a lot of my time in the vineyard aiding the estate's winemaker. We would train, prune, and strip leaves from the grapevines. The Maywood vineyard is only about 3 acres, and I remember being amazed by how much labor is required to yield a workable crop."

Wild ales were the recipient of a lot of our creative energy at Kent Falls, so we felt that a mixed culture saison would be the best home for grapes, as the fruit itself would naturally serve as a source of wild microbes. There would be a thematic significance to this as well, since a lot of the information brewers had access to regarding *Brettanomyces* and wild yeast, at least in the early years of craft beer, came from the wine industry. Winemakers had been notoriously concerned about *Brett* infections, and had thus invested a great deal of money and time researching the wild yeast found on grapeskins for the purposes of quality control. Now, of course, we would be turning that on its head, and embracing those same wild yeast as a new source of microbial diversity.

After discussing timing and quantities, we determined that we'd base a small batch wild ale around grape must (crushed grapes) that we'd be sourcing from Maywood. Our recipe would be loose and somewhat improvised in nature, since rather than industrial drums or carefully weighed sacks of fruit puree, our fruit would be arriving in the very unscientifically measured metric of "several buckets" of crushed grapes.

Grape must is essentially the winemaking equivalent of a brewer's mash, a mixture of crushed fruit containing the desired juice as well as skins, seeds, and some of the stems. Alongside the must we received from Maywood were a few extra buckets of pomace (the stuff that is left after the juice is pressed off the must — skins, seeds, stems — akin to spent grain in the brewing process). Since most of the sugar is removed with the pressed juice, pomace is limited in its uses, though the skins of the grape still contain a good amount of character.

When our buckets of freshly-crushed Cabernet Sauvignon grapes arrived at the brewery we discovered our grape must also contained rice hulls mixed in with the crushed skins, which the winemakers had added to help juice extraction. The whole mix of must, pomace, and rice hulls went into the fermenter before transferring the wort on top of it.

Since pomace is a by-product of the winemaking process, any winery that presses their own grapes will likely have plenty of it after harvest season, and many of them will be happy to pass it on to an opportunistic brewer. Just as a brewer is usually thrilled to find someone willing to put their spent grain to good use, a winemaker doesn't want to see their flavorful grapeskins go to waste. Must may be harder to come by, but some winemakers will have enough that they'll be willing to sell a small amount of must or juice. And of course, as with any type of fruit, there's always the option to simply buy packaged and sterilized juice from a specialty supplier.

Since we had planned to co-ferment our farmhouse ale directly on the fruit — stems, seeds, rice hulls, and all, but were uncertain exactly how much grape character our buckets of must and pomace would impart, we aimed to embrace the wild, co-fermented side of the beer and strike out for a lighter flavor profile, focused as much on fermentation character as fruit. This was probably for the best, as we were using a limited amount of actual juice, and pomace will not impart as much overt grape character. Many of the beers we produced

at Kent Falls had this goal: Lighter, nuanced, and fermentation-driven, given ample time to age and develop even when fermented in stainless rather than barrels. The result showed off not only the nuances of Maywood's Cabernet grapes, but their microbes as well.

Of course, many brewers may want their wine-beer hybrids to taste like, well, both. Pomace may be the easiest to obtain from a small local winery, but since pomace lends itself to a subtler flavor profile, using exclusively grape must or whole fruit will often be the best approach if one wishes to embrace the full flavors of both grape and grain.

When it comes to choosing the grape variety, the options are endless, but each will impart a different character. The strategy taken by Chris Basso of Newburgh Brewery in Newburgh, New York is straightforward and effective: Figure out what grows well in your region, then find a farm with plenty of it.

"Go to a tasting room and talk to someone," Basso recommends. "Talk to the farmers, the winemakers. Ask them: 'what do you have a lot of?'"

## BASE BEER STYLES

Embracing the philosophy of using what's there, Newburgh Brewing has released a wine-beer hybrid every year for the last five years. In previous years, Basso had designed a Belgian tripel-inspired beer modeled around the grape that seemed to grow most plentifully at nearby farms: Niagara grapes, which he sourced from Magnanini Winery in Wallkill, New York. Basso doubled down on Niagara grapes, known for their stereotypical grape aromas and pungent floral terpene notes, by marrying this local variety with a Belgian-style tripel fermented with a yeast that throws off just enough spice to balance out the sweeter, juicier flavor notes.

But for the 2018 harvest season, Basso decided to try something new.

"Brut IPA had been in the zeitgeist, so we'd talked about making one," Basso says. "We felt it would be cooler to wait for the grape harvest in the fall to do something a little different."



# Beer / Wine Hybrid Recipes



## KENT FALLS BREWING CO.'S WHEN LIFE GIVES YOU GRAPE MUST CLONE



(5 gallons/19 L, all-grain)  
OG\* = 1.048 FG = 1.000  
IBU = 10 SRM\* = 3 ABV = 6%

*\*Both the original gravity and SRM are numbers provided pre-grape addition. If you want to recheck the actual starting gravity, Kent Falls recommends taking a gravity reading from the fermenter after the grapes and wort have had time to incorporate, but prior to the onset of primary fermentation.*

### INGREDIENTS

9 lbs. (4.1 kg) Pilsner malt  
10 oz. (0.28 kg) white wheat malt  
2 lbs. (0.9 kg) Cabernet Sauvignon grape pomace  
1 lb. (0.45 kg) Cabernet Sauvignon grape must  
2 AAU Brewer's Gold hops (60 min.) (0.25 oz./7 g at 8% alpha acids)  
6 AAU Brewer's Gold hops (0 min.) (0.75 oz./21 g at 8% alpha acids)  
Wyeast 3711 (French Saison) or White Labs WLP590 (French Saison Ale), or LalBrew Belle Saison yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

Brewing protocol should follow your standard protocol for any light style beer. Mash at 152 °F (67 °C) for 60 minutes. Collect enough wort in the kettle for a 60-minute boil.

Add grape pomace (grape solids left after pressing) and grape must (crushed grapes) to fermenter before transferring wort. Add the last hop addition at the end of the boil and whirlpool for 15 minutes prior to cooling to fermentation temperature. Chill wort then transfer wort onto the grape must and pomace. Pitch yeast and aerate well. Ferment at 74–78 °F (23–26 °C) until gravity is stable. Upon hitting terminal gravity, age for an additional two weeks before packaging. Due to the large amount of particulate found in pomace and must, transferring to a secondary vessel for the final two weeks of aging may be helpful for achieving clarity.

## KENT FALLS BREWING CO.'S WHEN LIFE GIVES YOU GRAPE MUST CLONE



(5 gallons/19 L, extract only)  
OG = 1.048 FG = 1.000  
ABV = 6% IBU = 10 SRM = ~6

### INGREDIENTS

5.5 lbs. (2.5 kg) extra light dried malt extract  
8 oz. (0.23 kg) wheat dried malt extract  
8 oz. (0.23 kg) table sugar  
2 lbs. (0.9 kg) Cabernet Sauvignon grape pomace  
1 lb. (0.45 kg) Cabernet Sauvignon grape must  
2 AAU Brewer's Gold hops (60 min.) (0.25 oz./7 g at 8% alpha acids)  
6 AAU Brewer's Gold hops (0 min.) (0.75 oz./21 g at 8% alpha acids)  
Wyeast 3711 (French Saison) or White Labs WLP590 (French Saison Ale), or LalBrew Belle Saison yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

Heat 4 gallons (15 L) of water in your kettle up to 180 °F (82 °C) and turn off heat. Stir in the malt extracts and table sugar and continue stirring until everything is fully dissolved. Turn heat back on and bring to a boil. Boil for 60 minutes, adding hops according to the hop schedule.

Add grape pomace (grape solids left after pressing) and grape must (crushed grapes) to fermenter before transferring wort. Add the last hop addition at the end of the boil and whirlpool for 15 minutes prior to cooling to fermentation temperature. Chill wort then top off kettle with water to 5 gallons (19 L). Transfer chilled wort onto the grape must and pomace. Pitch yeast and aerate well. Ferment at 74–78 °F (23–26 °C) until gravity is stable. Upon hitting terminal gravity, age for an additional two weeks before packaging. Due to the large amount of particulate found in pomace and must, transferring to a secondary vessel for the final two weeks of aging may be helpful for achieving clarity.

# Beer / Wine Hybrid Recipes

## NEWBURGH BREWING CO.'S BRUTBOSS CLONE

(5 gallons/19 L, all-grain)  
OG\* = 1.046 FG = 1.000  
ABV = 5.5% IBU = ~30 SRM\* = 3



*Both the original gravity and SRM are numbers provided pre-grape addition. If you want to check the actual starting gravity, take a gravity reading from the fermenter after the grapes and wort have had time to incorporate, but prior to the onset of primary fermentation*

### INGREDIENTS

9 lbs. (4.1 kg) Pilsner malt  
1 gallon (4 L) Niagara grape must  
1 oz. (28 g) Cascade hops (0 min.)  
2 oz. (57 g) Lemondrop™ hops (whirlpool)  
4 oz. (113 g) Galaxy™ hops (dry hop)  
2 oz. (57 g) Lemondrop™ hops (dry hop)  
Amylo enzyme (dosage rate per manufacturer's instructions)  
Lalvin EC-1118 or Red Star Premier Cuvée or Wyeast 4021 (Dry White/Sparkling) yeast  
7/8 cup corn sugar (if priming)

### STEP BY STEP

Mash at 145 °F (63 °C) for 60 minutes, adding the Amylo enzyme at the start of the mash. After 60 minutes perform a starch conversion test. You may want to raise the mash temperature up to 158 °F (70 °C) for 15 minutes to make sure the enzymes finish their job. Sparge with enough water to collect roughly 5.5 gallons (21 L) of wort in the kettle. Boil for 60 minutes.

Add grape must (crushed grapes) to fermenter before transferring wort. Add the last hop addition at the end of the boil and whirlpool for 15 minutes prior to cooling to fermentation temperature. Chill wort then transfer onto the grape must. Pitch yeast and aerate well. Ferment at 74–78 °F (23–26 °C) until gravity is stable. Upon hitting terminal gravity, age for an additional two weeks before packaging. Due to the large amount of particulate found in must, transferring to a secondary vessel for the final two weeks of aging may be helpful for achieving clarity.

## NEWBURGH BREWING CO.'S BRUTBOSS CLONE

(5 gallons/19 L, extract only)  
OG = 1.046 FG = 1.000  
ABV = 5.5% IBU = ~30 SRM = 3



### INGREDIENTS

6 lbs. (2.7 kg) extra light dried malt extract  
8 oz. (0.23 kg) table sugar  
1 gallon (4 L) Niagara grape must  
1 oz. (28 g) Cascade hops (0 min.)  
2 oz. (57 g) Lemondrop™ hops (whirlpool)  
4 oz. (113 g) Galaxy™ hops (dry hop)  
2 oz. (57 g) Lemondrop™ hops (dry hop)  
Amylo enzyme (dosage rate per manufacturer's instructions)  
Lalvin EC-1118 or Red Star Premier Cuvée or Wyeast 4021 (Dry White/Sparkling) yeast  
7/8 cup corn sugar (if priming)

### STEP BY STEP

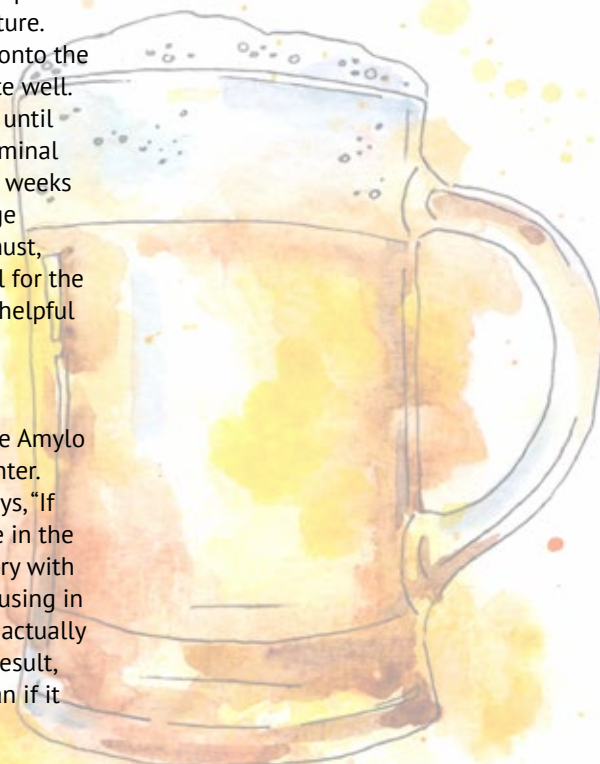
Begin with 4 gallons (11 L) of water in the kettle. Heat to 180 °F (82 °C) then turn off heat and stir in the dried malt extract, sugar, and Amylo enzyme. Bring wort to a boil and boil for 15 minutes.

Add grape must (crushed grapes) to fermenter before transferring wort. Add the last hop addition at the end of the boil and whirlpool for 15 minutes prior to cooling to fermentation temperature.

Chill wort then transfer wort onto the grape must. Pitch yeast and aerate well. Ferment at 74–78 °F (23–26 °C) until gravity is stable. Upon hitting terminal gravity, age for an additional two weeks before packaging. Due to the large amount of particulate found in must, transferring to a secondary vessel for the final two weeks of aging may be helpful for achieving clarity.

### TIPS FOR SUCCESS:

You have the option of adding the Amylo in the mash, boil, or in the fermenter. Newburgh Head Brewer Basso says, "If you want it very dry I suggest use in the mash. If you want it completely dry with zero residual sugars then I think using in the fermenter would be best. We actually use it in the mash for a very dry result, but we think it's a better beer than if it went to 0 °Plato."





## Tips for Brewing with Grape Puree from Magic Hat Head Brewer Christopher Rockwood



Through our trials at Magic Hat (South Burlington, Vermont) we have worked with fresh pressed grape must, concentrated grape must, and a puree. Through these iterations the character has been very similar. The puree does lend itself to a fuller flavor profile as you are still working with skin material and that will impart more of a tannic character to the finished beer. When working with a puree or a concentrate it is imperative to know the storage condition of the prod-

uct before you are using it. If it is not preserved properly (sulfites or frozen), natural wild yeast present on the grapes can begin fermentation; producing strong notes of sulfur in the finished beer.

If you are choosing to use puree, implementation in the process will be similar to grape must. Co-fermentation is a good way to deal with the fermentable sugars present in the puree. You will need to be familiar with your yeast strain of choice and its ability to handle large amounts of glucose. If your yeast struggles with glucose, you may consider a secondary fermentation addition of the puree with a fresh pitch of wine or Champagne yeast to finish the fermentation. We have had the most success with our house strain introducing the must/concentrate/puree 24 hours after knockout.

The biggest difference between varietal character in comparing purees to fresh grapes will appear when using white varieties. The basic flavors you would expect from a white varietal will appear whether you use must or puree; however, the tannic character may shift the flavor profile a bit. Beyond that, vintners finishing techniques may also shift the flavors you expect; i.e. Chardonnay is often oak aged and in the absence of interacting with the oak, you may be missing something you associate with the varietal.

Style and goals are critical when it comes to usage rates. If you are going for a strong varietal expression, you can lean on the heavy end (40–49% of the total amount of fermentable sugar). If you are looking to simply enhance the flavors of a beer, a minor addition of 3–5% of the total fermentable sugars can achieve that goal. Given that we are talking about fermentable sugar percentages when determining addition rates and not a volume ratio, it is important to know the gravity of your puree or must before getting started.

When it comes to choosing between must or puree, let your flavor goals be the biggest deciding factor. For a full-bodied red (think Merlot or Marquette), you may find that puree can provide a more rounded flavor profile that suits the project best.

For the Belgian tripel-inspired beer Basso crafted in previous years, they had boiled down the grape juice itself to a syrup, adding it as brewers would typically add candi sugar to boost the ABV. But for the brut IPA, Basso decided to try co-fermenting on

the fruit itself.

In keeping with the theme, Basso selected a sparkling Prosecco yeast to pitch, rather than the house ale yeast that they typically use for IPAs. Amyloglucosidase (AMG) was added to the mash to ensure a highly fer-

mentable wort — one of the signature attributes of the brut IPA style is its extreme dryness, and AMG is key to achieving this — though Basso points out that many brewers are also adding AMG in the fermenter as well, and he recommends taking this extra step if one desires an end product with zero residual sugar.

Some brewers might flinch at the thought of fermenting a clean IPA on whole fruit, likely teeming with microbes, but Basso says he wasn't concerned due to the extensive hopping and the extreme dryness of the finished product. Any bacteria, he says, were likely out-competed early on in fermentation, and the wild yeast on the grapes would only add a unique dimension, if they showed through at all.

"If there is any wild yeast on the grapes you might actually find something interesting, but you have to trust your source," Basso says.

For a quick turnaround beer like an IPA, Basso recommends adding extra yeast nutrient to ensure a healthy fermentation, especially if a high percentage of the sugars in your recipe are coming from grapes, since fruit won't supply as rich an environment for the yeast to feast upon as wort alone will. But for a wild ale designed for extended aging, this likely won't be an issue — in fact, a slower fermentation will be ideal for capturing a complex and nuanced profile, as an extended fermentation will give the slower, less developed wild yeast found on the grapes more opportunity to shine through.

Recipes for beers like these do not need to be complicated. Most of the brewers I talked to were of the same mind: Keep the recipe simple and let the ingredients do their thing. For Newburgh's brut IPA, Basso kept the grain bill to just Pilsner malt, and hopped the beer with Galaxy™ for its complementary fruity notes, as well as Cascade and Lemondrop™ to bring a touch of brightness to the end product. For the wild ales I brewed at Kent Falls, I liked to work with a similar grain bill: Usually just Pilsner malt with a body-enhancing grain like wheat or spelt mixed in for a bit of complexity and mouthfeel.

Of course, the base recipe can get

more adventurous too, but you as the brewer will have to know the grapes you're working with well to ensure that one aspect of the hybrid isn't lost. At Bruery Terreux, Grinkey has seemingly dabbled with a bit of everything, and has even created wine-beer hybrids with a rich, high-ABV stout base.


"A Cabernet grape can stand up to a stout, but a Pinot Noir grape, on the other hand, cannot. It's far too delicate," Grinkey says. "So understanding the wines that are made from the grapes will help you decide how to make a beer base that's complementary rather than contrasting."

As with beer, there's one surefire way to develop enough familiarity with a style or variety to know how to work with it in your own creations: Drink it, experience it, and learn from it.

"My thought is, we all drink a lot of beer before we start brewing and learning," Grinkey says. "Find a wine that you like and start planning on how to make that with beer."

### A SENSE OF PLACE

In recent years, more and more brewers are turning to the same factor that has always set wine apart: A sense of place. Breweries were once associated with factories churning out anonymous liquid, while wineries that make wine with their estate-grown grapes are thought of as the small, independent beverage producers tied to the land and the characteristics of a region. Now, of course, that's no longer the case: We're all fermenting liquids that seek to capture the essence of where we live and work. Co-fermenting a beer on wine grapes is a fantastic way to represent that sense of place in a liquid, but such a union necessarily starts with the people and places those ingredients originate from. If there are wineries in your area, they should be your first stop when designing such a project.

A brewer and winemaker have plenty of common ground. Working with local grapes allows you to share a local flavor in a different format. It breaks down the barriers between different beverages and might even get other people thinking about agriculture products and fermentation. 



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# HIGHLIGHTS

Vancouver, Washington • November 1 & 2, 2019

The Nano segment of craft brewing is growing fast with the majority of new breweries opening up falling into this small-scale, hyper-local segment working on brewing systems 5 barrels or under. But often this Nano niche can't relate to current educational events for the pro brewing industry because their scale of brewing and distribution models are so different from larger brewery companies.

Now's there's a conference just for you: The small-scale craft brewery. Learn the business, marketing, and brewing strategies targeted for your sized needs. From strategies to maximizing taproom sales to more accurately forecasting future ingredient purchases you'll learn over two days from experts and fellow Nano colleagues about actionable ways to improve – or launch – your brewery with ideas targeted just for your small-scale size and business direction.



## 30 BIG SEMINARS

Expert speakers will cover topics on brewing operations, sales and marketing, business operations, start-up and lots more all geared to Nano Breweries!

## ROUNDTABLE DISCUSSIONS

Peer-to-peer learning bringing full audience discussions on a variety of subjects so you can learn what is working – and what isn't – from others working in the Nano Craft Beer segment.

## TWO LUNCHES WITH KEYNOTE ADDRESSES

Learn during lunch with panel discussions on current Nano trends as well as expert tips for success on both the business and brewing side.



## NANO-FOCUSED VENDORS

Check out the latest in equipment, supplies, and ingredients from leading companies focused on your Nano market and your specific scale and needs.

## OPENING & CLOSING PACIFIC NORTHWEST BEER RECEPTIONS

Wrap up your full day of learning with sampling some of the Portland, Oregon region's finest craft beers served by the breweries on the trade show floor.

## OPTIONAL 2-DAY PRE-CONFERENCE START-UP BOOT CAMP

Spend two full days leading into NanoCon learning from Steve Parkes, Lead Instructor and Owner of the American Brewers Guild, about the keys to starting up a new craft brewery both on the business side as well as the brewery side. This popular class has regularly sold out at past events.



## OPTIONAL 1-DAY PRE-CONFERENCE BOOT CAMPS

Spend an immersive full-day workshop just before NanoCon starts exploring several key topics: Dr. Chris White on Yeast Management for Nanos, Audra Gaiziunas on Brewery Financials, and Ashton Lewis on Hands-On Nano Brewing Science.

## OPTIONAL PRE- AND POST-CONFERENCE PORTLAND-AREA BREWERY TOURS

Here's your chance to easily check out the Portland area's famed craft beer scene. We'll offer different tours on both the day before and the day after NanoCon. One trip will head across the river to explore breweries in Portland while the second tour will stay on the Washington side to visit local craft breweries.



# NANO LEARNING TRACKS



## BREWERY OPERATIONS



- Reliable Yeast Propagation Techniques
- 10 Mistakes Pro Brewers Make Impacting Beer Quality
- Brewing with Unmalted Adjuncts: From Flaked Oats to Coffee and Beyond
- Dry Yeast Techniques for Nanos
- New (and Classic) Pro Hopping Techniques
- Taproom Draft System Operations & Troubleshooting
- Do's and Don'ts of Mobile Canning & Bottling
- Nano Peer-to-Peer Table Topics

## SALES & MARKETING

- Latest Email Strategies to Boost Your Business
- Brewery Branding Through Taproom Events
- Creating a Customer-Centric Nano Business
- Social Media Best Practices for Breweries
- Great Event Ideas to Pack your Taproom
- Leveraging Local Tourism to Boost your Brewery Business
- Training your Taproom Staff
- Nano Peer-to-Peer Table Topics

## BUSINESS OPERATIONS

- Planning for Brewery Expansion
- Brewery-Specific Cash Flow Strategies
- 10 Insurance Mistakes Made By Small Breweries
- Your Biggest Legal Risks as a Brewery
- Roadmap to Better Brewery Financial Projections
- You're Never Too Small for Human Resources
- Understanding Taproom-Specific Accounting
- Nano Peer-to-Peer Table Topics

## START-UPS



- Keys to a Strong Nano Brewery Business Plan
- 10 Legal Steps to Take Before You Open Your Doors
- Nano Case Study: One Brewery's Journey from Idea to Reality
- Brewery Insurance 101: Protection from Conception to Operation
- 1 Barrel, 5 Barrel, or More? Determining System Size
- Branding Strategies for Start-Up Nanos
- Keys to a Successful Brewery Website
- Nano Peer-to-Peer Table Topics



## PRE-CONFERENCE NANO BOOT CAMPS

- Starting Up a Commercial Brewery (2-day class, Oct. 30 & 31)
- Hands-On Nano Brewing Science (1-day class, Oct. 30)
- Yeast Handling for Nano Brewers (1-day class, Oct. 31)
- Brewery Financials (1-day class, Oct. 31)

## PRE- AND POST-CONFERENCE CRAFT BREWERY TOURS

- Portland, Oregon Breweries
- Washington State Breweries

## RELIABLE YEAST PROPAGATION TECHNIQUES

### BREWERY OPERATIONS

Knowing how to properly and reliably step up the amount of yeast you need to pitch is a key skill for any professional brewer. And getting your fermentation off to a strong start with the right amount of healthy yeast is key to great beer. Take the guesswork out of this critical step by learning the correct techniques to propagate yeast in your brewery from one of the top experts in brewing yeast, Dr. Chris White, Founder and President of White Labs.

**DR. CHRIS WHITE** - PRESIDENT, WHITE LABS, INC.

## BREWERY-SPECIFIC CASH FLOW STRATEGIES

### BUSINESS OPERATIONS

Having a healthy cash flow is vitally important to any small brewing business (and helps owners sleep better at night!) As a business there are steps you can take to improve your cash flow to meet your spending needs. And as a brewery business there are industry-specific ways you can maximize cash flow with strategies that use the unique aspects of running a brewery to your advantage. Learn these specialized techniques to boost the amount of cash you have on hand with brewery financial expert Audra Gaiziunas. Who knows, you might even sleep better as a result too!

**AUDRA GAIZIUNAS** - OWNER, BREWED FOR HER LEDGER, LLC

## BRANDING STRATEGIES FOR START-UP NANOS

### START-UPS

Branding is essentially telling a story about your brewery. But with a start-up brewery you have an empty page of paper. Where do you start? How do you prioritize what you need to do with branding before you even pour a drop of beer? And how do you identify and then translate that story into a marketable package? Brewery branding consultant Ryan Wheaton is luckily here to help you make sure your first steps with figuring out your new brewery's branding strategies are the right ones and will offer a roadmap for future branding success.

**RYAN WHEATON** - FOUNDER, CRAFT BREW CREATIVE

## LATEST EMAIL STRATEGIES TO BUILD YOUR NANO

### SALES & MARKETING

Strategic email use can be a cost-effective way to boost beer sales, brand awareness, customer loyalty, special event attendance, and overall business in the taproom. But the key word is strategic – how much do you send, when do you send, and how do you even best build an email list? In this session you'll learn the latest email strategies other breweries are using to effectively build their sales and business from Alex Standiford, who consults and manages email programs for several small craft breweries.

**ALEX STANDIFORD** - DIRECTOR, FILLYOURTAPROOM.COM

DAY 1 • FRIDAY, NOVEMBER 1, 2019 | 9:30 – 10:30AM







10:30 – 11:00AM

## COFFEE BREAK & EXHIBITS

### NANO EXHIBITS

Grab a coffee and check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing's top vendors.



11:00AM – 12:00PM

## PLANNING YOUR BREWERY EXPANSION BUSINESS OPERATIONS

Congrats! Your Nano Brewery is doing well. You've got customers buying your beer, your taproom is humming along, and you are maxing out the amount of beer your system and fermenters can handle. So you are starting to think about expanding your brewery, but where do you start? How big are you going to go and what are the different key brewery and business aspects to consider? Learn how to plan your brewery expansion in a thoughtful and strategic way to avoid future headaches and surprises with Deborah Wood of Brewers Supply Group who has helped numerous craft breweries in Canada grow and expand their beer volumes and revenues.

**DEBORAH WOOD - BSG CANADA**

## SOCIAL MEDIA BEST PRACTICES FOR BREWERIES SALES & MARKETING

Anyone can use social media, but how to use it strategically as a brewery business is another story. From Facebook to Instagram to Twitter, there are plenty of opportunities to build your Nano business and create a more loyal community of potential customers. Learn how to make the most of your social media efforts whether it is to build your brand's personality, drive traffic to brewery events, fill up seats in your taproom, or reinforce your customer's connection to your brewery. Speaker Melissa Fears has worked at the intersection of craft beer and social media overseeing the social media program for the Oregon Brewers Festival, Oregon Brewers Guild, and Hopworks Urban Brewery. She will walk you through the keys to use your social media effectively as a brewery business.

**MELISSA FEARS - SOCIAL MEDIA STRATEGIST, SUSTAINABLE RESTAURANT GROUP**



## BREWERY INSURANCE 101: PROTECTION FROM CONCEPTION TO OPERATION START-UPS

Starting up a brewery can feel like a big risk, but that doesn't mean you can't take steps to manage and protect your new business from unnecessary exposure. And the brewing industry comes with a whole set of specific insurance demands you need to know about before you ever even mash in your first batch of beer. Robin Campbell of CedarBrew Insurance will walk you through the commercial brewery insurance landscape so you better understand what coverage you need to consider both in planning and in year one of operation.

**ROBIN CAMPBELL - RISK MANAGER, CEDARBREW INSURANCE**

## 10 MISTAKES PRO BREWERS MAKE IMPACTING QUALITY BREWERY OPERATIONS

Steve Parkes trains new commercial brewers for a living and over his decades of experience as one of the leaders in brewing education in North America he's seen it all. Now find out what are his top ten mistakes he sees fellow pro brewers regularly make that impacts beer quality. You'll walk away with an actionable list of ideas you can put to use in your brewery to make better beer. Get ready to learn how to avoid mistakes you may have never realized you were making – all in the name of better beer!

**STEVE PARKES  
BREWMASTER & OWNER, DROP-IN BREWING COMPANY  
OWNER & LEAD INSTRUCTOR, AMERICAN BREWERS GUILD**



## LUNCH & NANO TRENDS ROUNDTABLE

### GROUP SESSION

### NANO EXHIBITS

Listen and learn after you enjoy lunch as a range of craft beer industry veterans discuss trends specific to the Nano segment from both the business as well as beer side. Nano exhibitors will also be available over lunch to visit.

12:00 – 1:45PM



## EVENT IDEAS TO PACK YOUR TAPROOM ROUNDTABLE

### SALES & MARKETING

Find out from your fellow Nano Breweries what's working in terms of hosting special events at your tasting room and what hasn't. From themed parties to special releases to different competitions, Nano Breweries have gotten very creative coming up with new ways to bring old and new customers in their doors. We'll have a panel as well as open up discussions for the entire room so everyone can learn new ideas from each other.

2:00 – 3:00PM



## KEYS TO A STRONG NANO BREWERY BUSINESS PLAN

### START-UPS

There are plenty of templates out there for creating a business plan. But the brewing business has its own specific needs and specialized considerations to keep in mind when you want to convert your dreams into a potential brewery launch. Luckily we have Audra Gaiziunas who helps craft breweries-in-planning write better business plans that will help your new brewery move off the drawing board and more successfully into business.

**AUDRA GAIZIUNAS** - OWNER, BREWED FOR HER LEDGER, LLC

## YOUR BIGGEST LEGAL RISKS AS A BREWERY

### BUSINESS OPERATIONS

Are you opening up your brewery business to legal risks without even realizing it? Join craft brewery lawyer Matthew McLaughlin to go over the biggest potential areas of exposure you face running a brewery. The brewing business is unique and one filled with specialized legal concerns as a result of alcohol production and intellectual property. Be prepared to be surprised about possible legal problems that could harm your business and get in the way of your mission of making great beer at your Nano Brewery.

**MATTHEW MCLAUGHLIN** - FOUNDER, MCLAUGHLIN, PC

## BREWING WITH UNMALTED ADJUNCTS: FROM FLAKED OATS TO COFFEE & BEYOND

### BREWERY OPERATIONS

Barley malt. Hops. Water. Yeast . . . and gummy bears, coffee, flaked oats, and so much more. Brewing commercial beers with ingredients outside the traditional big four is more popular than ever before and a big driver to customer interest and sales in your taproom. But how do you best tackle these unmalted adjuncts in your brewery since most equipment set-ups are designed for more traditional brewing ingredients? Pro brewer Ashton Lewis is here to help you get creative with your brewing recipes while getting the most out of them and making the best beers you can. He'll walk you through techniques and best practices to use unmalted adjuncts in your Nano Brewery.

**ASHTON LEWIS**

BREWMASTER & CO-OWNER, SPRINGFIELD BREWING COMPANY  
SALES REPRESENTATIVE, BSG CRAFT BREWING  
TECHNICAL EDITOR, BREW YOUR OWN







3:00 – 3:45PM

## PACIFIC NORTHWEST NANO BEER BREAK & EXHIBITS

### NANO EXHIBITS

Sample some local Nano craft beer from the Portland-Vancouver area as you check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing's top vendors.



4:00 – 5:00PM

## ROADMAP TO BETTER BREWERY FINANCIAL PROJECTIONS

### BUSINESS OPERATIONS

Let's face it, if your business projections and forecasted budgets are not as accurate as they should be they won't do you or your brewery much good. Building your financial projections on a firm foundation will help you better anticipate the future money needs of your company and help you run it more strategically. The brewery business is highly specialized with unique accounting needs for this industry. CPA Maria Pearman focuses on the craft brewing segment and she will help you understand how to create more accurate projections for your Nano Brewery and give you a clear roadmap of what you should know and include in your forecasts.

**MARIA PEARMAN - PRESIDENT, RADIX ACCOUNTING**

## NANO CASE STUDY: ONE BREWERY'S JOURNEY FROM IDEA TO REALITY

### START-UPS

During the early start-up and planning phase of your journey to opening up a Nano Brewery, it is valuable to hear from somebody else who just walked that same path ahead of you. Mike Wenzel took his idea of opening a small-scale commercial brewery in upstate New York and turned it into a reality. Find out about the lessons he learned along the way, from what he got right and wrong in the planning stages to the current realities of the business side of making and selling his beer commercially. You'll be better prepared for your own journey to launching a brewery after you hear and learn from this Nano brewer who wants to share his very relevant experiences with you.

**MIKE WENZEL - CO-OWNER & BREWER, HELDERBERG MOUNTAIN BREWING CO.**



## MOBILE PACKAGING DO'S & DON'TS

### BREWERY OPERATIONS

With space and cash flow at a premium for many in the Nano niche of craft beer, the option of mobile canning and bottling lines opens up new sales channel possibilities without the required investment and upkeep with on-site equipment. Learn more about how to make the most of using a mobile packaging company so you can better take advantage of the flexibility these can provide you as a brewer and as a business.

**OWEN LINGLEY - OWNER, CRAFT CANNING & BOTTLING**

## BREWERY BRANDING THROUGH TAPROOM EVENTS

### SALES & MARKETING

Events in your taproom are a great way to bring old and new customers into your business to buy more of your beer. But events can also do much more than a one-time sales boost on a given day. Events can be a valuable tool in building and reaffirming your brewery's branding with customers (and even potential customers who don't attend the event but hear about it elsewhere.) Learn about the ways you can use your taproom events to not only drive sales, but also drive branding for your brewery as your story gets more defined in the public's eye. Ryan Wheaton, a brewery branding consultant, will walk you through how to incorporate branding into your taproom events that will help you long-term.

**RYAN WHEATON - FOUNDER, CRAFT BREW CREATIVE**



## PACIFIC NORTHWEST CRAFT BEER OPENING RECEPTION

### NANO EXHIBITS

We've invited some of our favorite Portland-Vancouver area craft breweries to join us to pour samples of their beer for you as a fun way to wrap up your first full day of NanoCon. You'll have the chance to talk with attendees, brewers, and visit with our exhibitors before you head out on the town to check out the incredible local brewery and taproom scene in the Vancouver-Portland area for the evening.

## 10 LEGAL STEPS TO TAKE BEFORE OPENING YOUR BREWERY

### START-UPS

One of the biggest blind spots and areas of concern for new breweries starting up is getting a grasp on all the legal paperwork required for both a small business and especially a small business producing and selling alcohol. Federal, state, and local permits and licenses need to be completed as well as a host of other legal considerations as you get ready to open your doors. We're lucky to have Matthew McLaughlin, an attorney with years of experience helping start-up craft breweries, lead this seminar so you can better understand some of the most important checklist items on the legal side of your business well before you ever pour your first pint.

**MATTHEW MCLAUGHLIN** - FOUNDER, MCLAUGHLIN, PC

## DRY YEAST TECHNIQUES FOR NANOS

### BREWERY OPERATIONS

One option many Nano Breweries are looking at increasingly in their ingredient selection is dry yeast. Dry yeast has come a long way since the days of old, not-so-viable dusty packets found under the lid of a malt extract can during your earliest homebrewing days. More strains are being released and the quality has improved dramatically. Nano Brewers have taken notice while also attracted to the ease of storage and shelflife in their small breweries. But since dry yeast has been out of the mindset of many commercial brewers for the last few decades, what are the best practices to using yeast in a dry format? How do you make sure dry yeast results in the kind of fermentations you want with the end qualities in the beer you serve? José Pizarro from Fermentis will help bring you up to speed on the new world of dry yeast and how best to use it in your brewery.

**JOSÉ PIZARRO** - NORTH AMERICAN REPRESENTATIVE, FERMENTIS

## LEVERAGING LOCAL TOURISM TO BRING IN MORE CUSTOMERS

### SALES & MARKETING

You are doing your best to get the word out in a variety of ways about your craft brewery. But why not piggyback your efforts along with your town or region's own tourism marketing efforts? Craft beer remains a hot draw for visitors wanting to check out local spots of interest. And local visitors' bureaus know this fact and most likely would love to feature your business in their promotions. Learn how teaming up with everyone from city beer tourism operators to your local tourism office can bring more customers in your door to buy your beer and how you can take advantage of this team dynamic to raise awareness for your brewery.

**MICHELLE MCKENZIE** - VISIT VANCOUVER USA

## UNDERSTANDING TAPROOM-SPECIFIC ACCOUNTING

### BUSINESS OPERATIONS

The accounting behind making your beer and selling your beer in your taproom needs to have different rules applied if you want to run your business more strategically. Learn what the key accounting and financial guidelines should be for your taproom so you can understand your numbers more accurately to be in a better position to forecast your future and make key decisions. Learn what you need to know about the numbers-side of your important taproom-side of your business from CPA Maria Pearman, who specializes in working with craft breweries.

**MARIA PEARMAN** - PRESIDENT, RADIX ACCOUNTING

5:00 -  
6:30PM

DAY 2 • SATURDAY, NOVEMBER 2, 2019 | 9:30 - 10:30AM







10:30 – 11:00AM

## NANO EXHIBITS & COFFEE BREAK

### NANO EXHIBITS

Refuel with a cup of coffee and check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing's top vendors.



11:00AM – 12:00PM

## NANO TABLE TALKS GROUP SESSION

Peer to peer learning from your fellow Nano industry people at its best. We'll have dozens of tables each assigned a different topic of interest to Nano Breweries spanning brewing, sales, business, and start-ups. For 30 minutes you will trade advice and tips with the other people at your table on that specific topic. Then you'll switch tables to another subject of interest to you. So you'll have the chance to gain knowledge on two different specific subjects you want to explore (and maybe make some new friends and contacts along the way!)

12:15 – 1:45PM

## LUNCH & NANO IDEA-O-RAMA ROUNDTABLE GROUP SESSION NANO EXHIBITS

Get ready to listen in as specialized craft beer experts each share their top favorite five ideas in a rapid-fire discussion after you wrap up lunch. Nano exhibits will also be open for you to explore during the lunch session.



2:00 – 3:00PM

## NEW (& CLASSIC) PRO HOPPING TECHNIQUES BREWERY OPERATIONS

The last few years have seen a change in how professional brewers look at hopping schedules and techniques with a shift towards late hopping. But there are still hopping techniques that have stood the test of time that also need to be considered as you pull together your next recipe. Pro brewer Ashton Lewis will cover both the new wave of hopping techniques as well as hit the classic hopping techniques you need to know as well. He'll cover both the hows and whys of the techniques so you can better understand when you make your hopping decisions.

**ASHTON LEWIS**  
BREWMASTER & CO-OWNER, SPRINGFIELD BREWING COMPANY  
SALES REPRESENTATIVE, BSG CRAFT BREWING  
TECHNICAL EDITOR, BREW YOUR OWN



## YOU'RE NEVER TOO SMALL FOR HUMAN RESOURCES BUSINESS OPERATIONS

Yes, you are a small business. Maybe you are even the only employee or have one or two others to help you out with the brewing and selling your beer. But that doesn't mean you shouldn't follow some basic guidelines when it comes to human resources. Having procedures in place will help you navigate any potential trouble spots that can pop up and cause you much more than just headaches. Nano Brewery owner and Human Resources consultant Sean Lopolito will help you understand what you should minimally have in place for your brewery business from a human resources standpoint to protect yourself and your business. It might not be as fun as brewing beer, but in many ways it is just as important.

**SEAN LOPOLITO**  
OWNER, LOPS BREWING  
PRESIDENT, PINEHURST CONSULTING GROUP

## CREATING A CUSTOMER-CENTRIC NANO BUSINESS

### SALES & MARKETING

The old saying is “The customer is always first.” But what exactly does that mean and how do you implement a customer-centric business? And what are the actual benefits of being customer-centric as you hand a pint of beer to a patron across the bar in your taproom? Get the answers to these questions and how being customer-centric can positively impact your bottom line with Audra Gaizunas who works with craft breweries on the financial side of their businesses. She is all about hard numbers so you’ll leave knowing more about the financial upsides of being customer focused.

**AUDRA GAIZUNAS - OWNER, BREWED FOR HER LEDGER, LLC**

## I-BARREL, 5-BARREL, OR MORE? DETERMINING SYSTEM SIZE

### START-UPS

How big or small a brewing system do you want to have in place at your planned brewery? That’s a pretty big question to answer and there are lots of factors to consider. How much beer do you want to produce? How much beer do you think you can sell? How often do you want to be brewing each week? Are there space limitations for your brewhouse? Walk through these questions and many more with John Blichmann who helps craft breweries figure all this out as a producer of small-scale brewing systems. During his years of selling small-scale systems John has heard all the questions and is the perfect person to help you on the path of deciding how big or small a system you should have in place on day one.

**JOHN BLICHMANN - PRESIDENT, BLICHMANN ENGINEERING**

## PACIFIC NORTHWEST NANO BEER BREAK & EXHIBITS

### NANO EXHIBITS

We’ve invited a new group of local Nano Breweries from around Portland and Vancouver to pour samples and visit with as you check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing’s top vendors.

## TRAINING YOUR TAPROOM STAFF

### SALES & MARKETING

Your taproom staff is the frontline of interacting with your end customers. They can easily help or hurt beer sales based on how well they interact with visitors. And ultimately they are a reflection of your brewery and will influence the enjoyment of your beer being served. Learn the best practices for training your taproom staff and how to make them more knowledgeable about your brewery’s beers they are being asked to sell to customers. A server or bartender more knowledgeable about your beer will translate to a better customer experience, which then translates to more sales. Learn how to make sure your staff maximizes the opportunity to turn a first-time visitor into a longtime customer with the right training about your beer.

**JESSICA FERRELL - INSTRUCTOR, BUSINESS OF CRAFT BREWING PROGRAM, PORTLAND STATE UNIVERSITY**

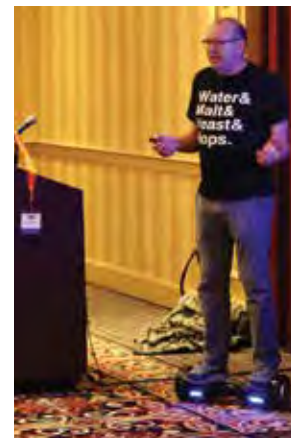
## TAPROOM DRAFT SYSTEM OPERATIONS & MAINTENANCE

### BREWERY OPERATIONS

You work hard to produce great beer in the brewery. Shouldn’t you work just as hard to make sure that beer makes it from keg to glass in great shape? Cleaning draft lines and making sure your draft system is operating properly should be a priority when running a taproom. Learn the right cleaning techniques, how often to clean, and what other regular maintenance you should be doing so your draft system does the beer you brewed justice. Nick Klein, who works in the Portland, Oregon area working with draft systems, will teach you what you need to know so you can better take care of your draft beer back home at your brewery.

**NICK KLEIN - ACCOUNT MANAGER, NORTHWEST DRAFT TECHNICIANS**

2:00 – 3:00PM



3:00 – 3:45PM



4:00 – 5:00PM







4:00 – 5:00 PM

## KEYS TO A SUCCESSFUL BREWERY WEBSITE

### START-UPS

Your website will be your billboard to the outside world for your new brewery. But what website elements need to be included as you design this new brewery website? Website budgets can quickly spiral upward if you aren't strategic about pages you need versus those that won't matter as much. You'll learn these website planning strategies from Alex Standiford who builds websites for breweries and has first-hand knowledge of what works and what doesn't for craft breweries. And ultimately what will drive more business to you and dollars to the bottom line.

**ALEX STANDIFORD** - DIRECTOR, FILLYOURTAPROOM.COM



## 10 BREWERY INSURANCE MISTAKES TO AVOID

### BUSINESS OPERATIONS

Are you underinsured or even not insured and exposed to risk without realizing it? Craft brewing is a specialized industrial business with plenty of potential problems in addition to all that wonderful beer. Having the right insurance coverage in place, including policies specific for brewing beer, will reduce your exposure to unwanted risk. Robin Campbell will walk you through her top ten list of insurance mistakes you can avoid as a brewing business. You'll learn from other brewery's mistakes and leave with a better understanding of where you stand right now and what insurance moves you might want to consider.

**ROBIN CAMPBELL** - RISK MANAGER, CEDARBREW INSURANCE



5:00 – 6:30 PM

## PACIFIC NORTHWEST CRAFT BEER CLOSING RECEPTION

### NANO EXHIBITS

We've invited some more of our favorite craft breweries from Vancouver and Portland to join us to pour samples of their beer for you as a fun way to wrap up NanoCon. You'll have this final chance to talk with attendees, speakers, local brewers, and visit with our exhibitors before you head out to check out the Portland-Vancouver area's breweries and craft beer taprooms for Saturday night.





As an attendee, you'll have the opportunity to check out the latest Nano-sized brewing equipment, products, supplies & services from leading craft brewery vendors Friday & Saturday in the Heritage Ballroom.

# Thanks to our **BYO NANO** Sponsors!





# GREAT CONFERENCE HOTEL IN THE BEERVANA OF PORTLAND-VANCOUVER!

## Vancouver Hilton • Vancouver, Washington

The 2019 NanoCon is being held at the Vancouver Hilton just across the river from Portland, Oregon. The Portland-Vancouver area is an international leader in the craft beer world with 80+ local breweries to discover. You not only have the chance to learn strategies to be more successful at your own brewery all day at the conference, but we've set up the schedule so you can also explore on your own this incredible local craft beer scene at night.

Vancouver Hilton  
301 W. 6th Street  
Vancouver, Washington 98660

## Telephone Reservations: 360-993-4500

Mention group name "BCI" to receive a special discounted rate.

## Web Reservations:

[byo.com/nanocon](http://byo.com/nanocon)

## Group Discounted Room Rate:

\$169 per night for a room with either one king bed or two queen beds.



**Hotel Information:** We have reserved a limited number of rooms at a special discounted rate for attendees. Contact the hotel directly for your room reservations. When making your reservations make sure to say you are attending the "NanoCon" to receive the special discounted group rate for your room. Rooms are available on a first-come, first-served basis. The special discounted rate will be available until the conference group block of rooms is sold out (which it did last year), so reserve your room right after registering for the conference.

*\*Please make sure you have already successfully registered for the conference before making your hotel room reservations or any other travel plans.*

**BYO.COM/NANOCON**

**REGISTER BY SEPTEMBER 16 TO SAVE \$100**

# COME EARLY OR STAY LATE: PRE- AND POST-NANOCON ACTIVITIES



**WEDNESDAY, OCTOBER 30 &  
THURSDAY, OCTOBER 31**

## **STARTING UP YOUR OWN COMMERCIAL BREWERY BOOT CAMP**

**10 a.m. – 5 p.m. both days  
With Steve Parkes (\$450 for NanoCon attendees, \$525 for non-attendees)**

Over Wednesday & Thursday you'll walk through the steps, planning decisions, and keys you need to know on both the brewing and management side to successfully open a commercial craft brewery with the Lead Instructor and Owner of the American Brewers Guild Steve Parkes, who had trained hundreds of professional brewers. Learn from Steve's decades of expertise and wide range of experience to help you better achieve your goals. Over two full days you'll be guided through all the various elements you'll have to know for the next big step toward starting a craft brewery. This two-day workshop is the perfect lead-in to the main NanoCon event if you already have a brewery in planning or are just starting to consider the possibility of opening one up yourself.

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**WEDNESDAY, OCTOBER 30  
HANDS-ON NANO BREWERY SCIENCE**

**10 a.m. – 5 p.m.  
With Ashton Lewis (\$225 for NanoCon attendees, \$275 for non-attendees)**

Get hands-on with pH meters, slants and loops, stir plates, centrifuges, and other brewing science gear with professional brewer and *BYO* Technical Editor Ashton Lewis. Ashton will walk you through what your Nano Brewery should have in terms of scientific testing equipment and how to best use this gear to improve quality control over your beer. You'll have the chance to understand how to not only use and care for the equipment properly, but also how to use the results to boost the consistency and quality of your brewery's beer. This workshop will focus only on those pieces of equipment suitable – and affordable – for a small-scale Nano craft brewery.

ton will walk you through what your Nano Brewery should have in terms of scientific testing equipment and how to best use this gear to improve quality control over your beer. You'll have the chance to understand how to not only use and care for the equipment properly, but also how to use the results to boost the consistency and quality of your brewery's beer. This workshop will focus only on those pieces of equipment suitable – and affordable – for a small-scale Nano craft brewery.



**THURSDAY, OCTOBER 31  
BREWERY FINANCIALS**

**10 a.m. – 5 p.m.  
With Audra Gaiziunas (\$225 for NanoCon attendees, \$275 for non-attendees)**

You'll start the day by gaining an understanding of the importance of finance and accounting in craft beer and learn the top financial mistakes craft breweries make (and how to avoid them). You'll then be introduced to the basics of the brewery

balance sheet, income statement, and cash flow statements to understand how they all tie together for your brewery business. You'll also learn basic ratio analysis to better communicate with bankers and investors. Brewery cost accounting will be covered including beer recipe costing and overhead allocation. Plus during this full-

day workshop budgeting, inventory management, and standard operating procedures you should have in place will be discussed. You'll leave this workshop armed with the tools and confidence to better understand and manage your Nano Brewery's financial needs.

**THURSDAY, OCTOBER 31  
BEST YEAST HANDLING PRACTICES FOR THE NANO BREWERY**

**10 a.m. – 5 p.m.  
With Dr. Chris White (\$225 for NanoCon attendees, \$275 for non-attendees)**

Join Dr. Chris White of White Labs as he discusses how to master different yeast-related techniques for your Nano Brewery. This full-day workshop will cover culture selection and explore preparing yeast for pitching, what to expect when re-pitching, working with multiple cultures, and how to troubleshoot fermentation issues related to poor yeast-handling practices. Plus you'll learn from Dr. White on the collection and storage of yeast, utilizing yeast for multiple generations, determining proper pitch rates, yeast nutrition, creating ideal fermentation conditions, and fermentation troubleshooting when problems do occur.



**THURSDAY, OCTOBER 31 AND  
SUNDAY, NOVEMBER 3  
WASHINGTON CRAFT BREWERY TOURS (\$175)**

**Thursday, October 31  
5 p.m. – 9 p.m.  
Sunday, November 3  
11 a.m. – 3 p.m.**

This four-hour tour includes round-trip transportation from our NanoCon hotel, the Vancouver Hilton, while tasting and visiting four different breweries in the greater Vancouver area. Beer and a meal is included as you explore a variety of different craft breweries on the Washington side of the river.



**PORTLAND, OREGON CRAFT  
BREWERY TOURS (\$175)**

**Thursday, October 31  
11 a.m. – 4 p.m.  
Sunday, November 3  
3:30 – 8:30 p.m.**

This four-hour tour includes round-trip transportation from our NanoCon hotel, the Vancouver Hilton, while tasting and visiting four different breweries in Portland. Beer and a meal is included as you explore a variety of different craft breweries here in the city referred to as Beervana.





# SCHEDULE AT-A-GLANCE



## Pre-Conference NanoCon Boot Camps • Wednesday, October 30, 2019

|                    |  |
|--------------------|--|
| 10:00 AM – 5:00 PM | Starting Up a Commercial Craft Brewery Boot Camp (Day 1) |
| 10:00 AM – 5:00 PM | Hands-On Nano Brewing Science Boot Camp                  |

## Pre-Conference NanoCon Boot Camps & Brewery Tours • Thursday, October 31, 2019

|                    |   |
|--------------------|---|
| 10:00 AM – 5:00 PM | Starting Up a Commercial Craft Brewery Boot Camp (Continued, Day 2) |
| 10:00 AM – 5:00 PM | Brewery Financials Boot Camp  |
| 10:00 AM – 5:00 PM | Yeast Handling for Nano Brewers Boot Camp                           |
| 11:00 AM – 4:00 PM | Portland Craft Brewery Tour   |
| 5:00 – 9:00 PM     | Washington Craft Brewery Tour                                       |

## NanoCon Day #1 • Friday, November 1, 2019

|                  |   |   |   |   |
|------------------|---|---|---|---|
| 8:00 – 9 AM      | REGISTRATION                                      |   |   |   |
| 9:00 – 9:15 AM   | WELCOME & INTRODUCTION                            |   |   |   |
| 9:30 – 10:30 AM  | Branding Strategies for Start-Up Nanos            | Reliable Yeast Propagation Techniques                       | Brewery-Specific Cash Flow Strategies       | Latest Email Strategies to Boost Business                             |
| 10:30 – 11:00 AM | COFFEE BREAK & NANO EXHIBITS                      |   |   |   |
| 11:00 – 12:00 PM | 10 Mistakes Pro Brewers Make Impacting Quality    | Planning Your Brewery Expansion                             | Social Media Best Practices for Breweries   | Brewery Insurance 101: Protection from Conception to Operation        |
| 12:15 – 1:45 PM  | LUNCH & NANO TRENDS ROUNDTABLE                    |   |   |   |
| 2:00 – 3:00 PM   | Events Ideas to Pack Your Taproom Roundtable      | Your Biggest Legal Risks as a Brewery                       | Keys to a Strong Nano Brewery Business Plan | Brewing with Unmalted Adjuncts: From Flaked Oats to Coffee and Beyond |
| 3:00 – 3:45 PM   | PACIFIC NORTHWEST NANO BEER BREAK & NANO EXHIBITS |   |   |   |
| 4:00 – 5:00 PM   | Roadmap to Better Brewery Financial Projections   | Nano Case Study: One Brewery's Journey from Idea to Reality | Mobile Packaging Do's & Don'ts              | Brewery Branding through Taproom Events                               |
| 5:00 – 6:30 PM   | PACIFIC NORTHWEST CRAFT BEER OPENING RECEPTION    |   |   |   |

## NanoCon Day #2 • Saturday, November 2, 2019

|                     |  |   |   |  |
|---------------------|--|---|---|--|
| 9:30 – 10:30 AM     | 10 Legal Steps to Take Before Opening your Brewery | Dry Yeast Techniques for Nanos                | Leveraging Local Tourism to Bring In More Customers | Understanding Taproom-Specific Accounting            |
| 10:30 – 11:00 AM    | COFFEE BREAK & NANO EXHIBITS                       |   |   |  |
| 11:00 AM – 12:00 PM | NANO TABLE TALKS                                   |   |   |  |
| 12:15 – 1:45 PM     | LUNCH & NANO IDEA-O-RAMA ROUNDTABLE                |   |   |  |
| 2:00 – 3:00 PM      | New (and Classic) Pro Hopping Techniques           | You're Never Too Small for Human Resources    | Creating a Customer-Centric Nano Business           | 1 Barrel, 5 Barrel, or More? Determining System Size |
| 3:00 – 3:45 PM      | PACIFIC NORTHWEST NANO BEER BREAK & NANO EXHIBITS  |   |   |  |
| 4:00 – 5:00 PM      | Training Your Taproom Staff                        | Taproom Draft System Operations & Maintenance | Keys to a Successful Brewery Website                | 10 Brewery Insurance Mistakes to Avoid               |
| 5:00 – 6:30 PM      | PACIFIC NORTHWEST CRAFT BEER CLOSING RECEPTION     |   |   |  |

## Post-Conference NanoCon Brewery Tours • Sunday, November 3, 2019

|                    |                               |
|--------------------|-------------------------------|
| 3:30 – 8:30 PM     | Portland Craft Brewery Tour   |
| 11:00 AM – 3:00 PM | Washington Craft Brewery Tour |

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State/Province \_\_\_\_\_  
 Zip/Postal Code \_\_\_\_\_ Country \_\_\_\_\_  
 Phone \_\_\_\_\_  
 E-mail \_\_\_\_\_

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### EARLY DISCOUNT\* - BY SEPT. 16

\$699 Full Conference

### REGULAR

\$799 Full Conference

### PRE-NANOCON BREWERY BOOT CAMPS

- |  |       |
|--|-------|
| <input type="checkbox"/> 2-Day Brewery Start-Up Boot Camp for NanoCon Attendees (Oct. 30 & 31)   | \$450 |
| <input type="checkbox"/> 2-Day Brewery Start-Up Boot Camp Only (Oct. 30 & 31)                    | \$525 |
| <input type="checkbox"/> 1-Day Hands-On Nano Brewery Science for NanoCon Attendees (Oct. 30)     | \$225 |
| <input type="checkbox"/> 1-Day Hands-On Nano Brewery Science Boot Camp Only (Oct. 30)            | \$275 |
| <input type="checkbox"/> 1-Day Brewery Financials for NanoCon Attendees (Oct. 31)                | \$225 |
| <input type="checkbox"/> 1-Day Brewery Financials Boot Camp Only (Oct. 31)                       | \$275 |
| <input type="checkbox"/> 1-Day Yeast Management for Nano Brewers for NanoCon Attendees (Oct. 31) | \$225 |
| <input type="checkbox"/> 1-Day Yeast Management for Nano Brewers Boot Camp Only (Oct. 31)        | \$275 |

### PRE- & POST-NANOCON CRAFT BREWERY TOURS

\* Open to attendees and their guests

- |   |       |
|---|-------|
| <input type="checkbox"/> Thursday, October 31, 11:00 AM – 4:00 PM Portland-area Breweries | \$175 |
| <input type="checkbox"/> Thursday, October 31, 5:00 – 9:00 PM Washington Breweries        | \$175 |
| <input type="checkbox"/> Sunday, November 3, 3:30 – 8:30 PM Portland-area Breweries       | \$175 |
| <input type="checkbox"/> Sunday, November 3, 11:00 AM – 3:00 PM Washington Breweries      | \$175 |

Discounted hotel rooms need to be reserved directly with Vancouver Hilton  
 For details: [byo.com/nanocon](http://byo.com/nanocon)

**4 WAYS to REGISTER**

WEB PAGE:  
[BYO.COM/NANOCON](http://BYO.COM/NANOCON)

MAIL THIS FORM WITH PAYMENT TO:  
 BYO NANOCON  
 5515 MAIN STREET  
 MANCHESTER CENTER, VT 05255

PHONE:  
 802-362-3981 EXT. 106

FAX THIS FORM TO:  
 802-362-2377

» PLEASE NOTE A SEPARATE REGISTRATION FORM IS REQUIRED FOR EACH NANOCON ATTENDEE »

### YOUR NANOCON REGISTRATION INCLUDES:

- » Admission to the conference's full two-day schedule of seminars
- » Two Lunches with Roundtable Programs
- » Nano Exhibits Admission
- » NanoCon Welcome Bag
- » One Year (8 issues) Print Subscription/Renewal to *Brew Your Own Magazine*  
 (Your discounted hotel room needs to be reserved directly with the Vancouver Hilton, go to [byo.com/nanocon](http://byo.com/nanocon) for more details.)



### PAYMENT METHOD

- Check Enclosed (payable to BYO magazine)  
 Credit Card       Visa       MasterCard       AMEX

Card # \_\_\_\_\_ 3-Digit CCV# \_\_\_\_\_ Exp. Date \_\_\_\_\_

Name on card: \_\_\_\_\_

Signature: \_\_\_\_\_

By registering for the conference, I give permission for the free use of my name and photo in any media account of this event. I also certify that I am 21 years of age or older. Cancellation policy: For a refund, less a \$100 administrative charge per person, send written notice by October 1, 2019. Refund requests after October 1, 2019 will not be refunded. All refund requests will be processed post-conference. Early Discount registration must be received and paid for in full by September 16, 2019.





## Commercial Grade Fermentations



All-in-one solid state cooling & heating  
No pumps, no coolers, no frozen 2-liters

35° + / - Ambient

BrewJacket.com

US Patent No. 9423163

Now accepting registrations for January 2020 classes!



### BREWING SCHOOL

**Intensive Brewing Science & Engineering (IBS&E)**

22-week distance education program followed by a residential week at the Drop-In Brewing campus

**Craft Brewers Apprenticeship Program (CBA)**

The IBS&E course with a five week apprenticeship at a mutually agreed upon brewery.



The American Brewers Guild Brewing School boasts a 5,600 square foot classroom, laboratory, and brewery facility in beautiful Middlebury, VT. The campus is also home to a full scale commercial brewing operation, Drop-In Brewing, dedicated to the educational needs of American Brewers Guild students.

Application forms and more info can be found at:

[www.abgbrew.com](http://www.abgbrew.com)

phone: 802-352-4200

[info@abgbrew.com](mailto:info@abgbrew.com)

# ANVIL

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6.5 GALLON  
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# FALL LAGERS

## Taking advantage of the seasons

**C**an you smell it? It's that particular smell. Seasons changing, leaves beginning to crisp, curl, and lose their fresh greenness. The air's making promises and maybe the weather will follow suit. Autumn's promise of chilly slumber lies thick in the breeze and naturally that makes us think of lagered beer that's rich to sip and takes advantage of our longer nights and lowering temperatures.

The good news is despite the complicated rumors you've heard, the truth is that there's not really a lot more — some would say any more — to fuss over than you do in a regular fermentation. It's a straight-forward process with straight-forward results.

Remember malted barley wants to become beer lager!

### SETTING THE STAGE

Let's do the basic recap because that's what all good teachers should do! The word lager simply means "to store" in German. That's because the magic of lager is traditionally ascribed to a period of long cold storage. Think a cold ferment in the 50 °F (10 °C) range, followed by weeks or months at near freezing temps.

The yeasts that do well in those conditions given "proper" circumstances can produce exceptional beers with less residual sugar and a cleaner finish. Naturally, since we're using German terms, we tend to think of the whole world of lagers being wrapped up in that area of Germany and the Czech Republic. No surprise that with their long cool seasons, they've developed a raft of beers to keep you warm. (No matter the opinions of some local writers who think anyone drinking anything other than helles is strange.)

### OUR RULES FOR BREWING A GOOD FALL LAGER

1. Good malt and/or fresh extract
2. Water balanced to chloride for enhanced malt profile
3. Appropriate yeast choice
4. Appropriate yeast amount
5. Fermentation control

Unlike the hoppy beers that we seem to be downing by the fistfuls in modern craft times, a good fall lager is all about the malt. Remember that stuff? Requires you to steep it and provides the sugar yeast convert into alcohol — rumor has it that it can also add color, body, and odd aromas that don't smell anything like pine, citrus, or tropical fruits. It's time to break away from the exclusively pale malts!

It's also time for you to really pay attention to your malt. When you walk into your local homebrew shop, you hopefully will be confronted with a plethora of options. In some stores the choice is mind bogglingly confounding. But here's a simple rule — choose the best malt for the job. Ignore the price. Don't try and calculate costs per pint. Choose the best tasting malt and for many of these styles, that's going to be German malts. Denny likes the products of Best Malz, although these days he generally reaches for Mecca Grade Estate malt even for German styles. Depending on where you live, it can be difficult to get and that's when the Best Malz is useful. Drew digs the flavors from Weyermann. Both are stalwarts of the German brewing world.

But what are you really looking for? You're looking for flavor. Don't be shy when you're roaming around the shop. Make like a kid in a penny candy shop. Grab a couple of kernels and

We're still following the modern trend of avoiding too many caramel/crystal malts because despite what we've been raised to think — malty is not the same as sweet.



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pop them in your mouth. Crunch them up and hold them there for a few seconds. You want to let the enzymes in your saliva attack the starches to create a small dose of sugar. It's an imperfect test, but it gives you the basic idea about the grain. For most of our target styles, we're looking for the deep toasty tones of Munich malt. We're still following the modern trend of avoiding too many caramel/crystal malts because despite what we've been raised to think — malty is not the same as sweet. Extract brewers can find equivalents in this department as well. Don't be afraid to use some Munich, Vienna, and Pilsen extract in the same recipe, like an all-grain brewer might.

On the water front, the most important thing you can approach in your water chemistry is to balance the inherent acidity of a roastier malt found in some of these styles. To counter higher acidity malts we recommend pickling lime. The traditionally-used calcium carbonate is less effective at pH adjustment due to its lower solubility. We also usually recommend some additional calcium chloride to boost the perception of the malt as well. As always, we suggest using a water profiler (we both use and recommend Bru'nwater) to make sure you're hitting your levels correctly. As we always

have a neutral bittering hop like Magnum on hand, those latter hops can also be used for bittering.

For yeast, this one is both simple and complex — nearly any clean lager yeast will work. The flavors of lager yeasts are subtler, but some of them do have interesting behaviors. The workhorse of the lager world is the SafLager W-34/70 (see also Wyeast 2124/White Labs WLP830). It's truly universal and nearly Drew proof. Others include the various "Munich/Oktobertfest" strains, which do require a diacetyl rest to complete fermentation. One of Drew's absolute favorites is the White Labs WLP833 (German Bock) strain, which always makes for a booming malt character. Denny reaches for Wyeast 2206 (Bavarian Lager) in these brews. In the dry yeast world, SafLager S-189 is also a great strain (and trouble-free!) for lagers that are really malt-forward.

Even a clean ale yeast strain works well. Denny has had great results making "pseudo lagers" with both Wyeast 1007 (German Ale) and 1056 (American Ale) strains. Both will ferment well in the mid to upper 50s °F (low teens °C) if you can manage that.

One place where you do need to pay attention to lagers is that you need more yeast than you do for ales. Don't stress

**“ We generally recommend that you make a starter that's at least half again as big as your usual starter for a similar-sized ale. ”**

like to remind people — don't get hung up on trying to perfectly replicate a purported Munich water profile. You can tie yourself into knots and actually make your beer worse by over doing it. Use a water profile based on the color and flavor of the beer as well as what you're looking for in the final product. Extract brewers, remember that the maltster already did the water chemistry for you, so either very soft or reverse osmosis water is the best place to start. You can then make additions like calcium chloride if you so desire, but keep these additions small.

Now that you've got malt and water, you'll need to combine them. Many traditional recipes call for using the laborious decoction method. Neither of us advocates it even if traditionalists will proclaim that it provides a bigger, richer malt character. We feel like the best reason to do a decoction mash is because you enjoy the process. We stick to a simple infusion mash schedule for our needs. (If you want to really try something crazy go read about Czech lager mashing schedules that virtually require brewers in shifts.)

For hops, the key thought is "kiss of." Put away the fistfuls of hops we all throw into the kettle. Focus on the "noble" and noble-adjacent varieties. We like to bitter with a neutral hop like Magnum (because it makes life easy and the boil flavor impact is low) before switching to classics like Saaz, Spalt, Tettnang (in its various forms), Hallertauer, or noble-ish American hops like Willamette, Mt. Hood, Liberty, or Sterling. Focus on herbal and spicy characters. If you don't

over yeast calculator numbers. We generally recommend that you make a starter that's at least half again as big as your usual starter for a similar-sized ale. If you normally make 1-qt. (1-L) starter for your ales, make them 1.5 qts. (1.5 L) for your lagers.

As we've mentioned, lagers are traditionally fermented cool. Low- to mid-50s °F (low-10s °C) is pretty standard. There have been recent discoveries in yeast genetics that have shown linkages between ale and lager yeasts. Many yeasts that are thought of as lager strains actually have ale-yeast genetics. That means you have some wiggle room with several strains.

For example the Wyeast 2124 (Bohemian Lager), White Labs WLP830 (German Lager), and SafLager W-34/70 strains all work really well at higher temperatures than traditionally-fermented lagers. That comes in handy if you don't have real fermentation temperature control. You still don't want to go crazy and ferment them in the 70s °F (low 20s °C), but low- to mid-60s °F (high teens °C) works well. Just keep in mind that you'll still have to have some way of lagering them after fermentation.

### **“WARM” FERMENTATION**

As radical as it may seem to traditional lager brewers, you can make great lagers at higher temperatures than thought possible just a few years ago. Now, you don't want to go high-temperature crazy like if you were using kveik yeast,

# FALL LAGER RECIPES

## OLD MAN DARK

(5 gallons/19 L, all-grain)  
OG = 1.051 FG = 1.012  
IBU = 20 SRM = 15 ABV = 5%



### INGREDIENTS

11 lbs. (5 kg) German dark Munich malt (10 °L)  
2 oz. (57 g) Weyermann Carafa® Special II malt  
3.75 AAU Magnum pellet hops (60 min.) (0.25 oz./7 g at 15% alpha acids)  
2.25 AAU Tettnanger hops (20 min.) (0.5 oz./14 g at 4.5% alpha acids)  
Wyeast 2124 (Bohemian Lager), White Labs WLP830 (German Lager), or SafLager W-34/70 yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

This is a single infusion mash. Heat 16.7 qts. (15.8 L) of water, add 1 tsp. of calcium chloride. Mash grains for 60 minutes at 152 °F (67 °C). Sparge with enough water to collect 6.5 gallons (25 L) of wort in the kettle. Bring wort to a boil and boil for 60 minutes, adding hops according to the recipe above. Add a kettle coagulant of your choice if you so desire.

After the boil is complete, give the wort a long stir to create a whirlpool and let settle for 10 minutes, then begin to chill. Bring down to yeast-pitching temperature, aerate the wort, and pitch the yeast.

Fermentation temperature can vary depending on your fermentation control. You can ferment from about 55–65 °F (13–18 °C). Ferment for 1–2 weeks at this temperature, Transfer to a secondary and lager for 1–4 weeks at 33–35 °F (0–2 °C). Bottle or force carbonate per normal.

**Extract brewers:** Swap out the dark Munich malt with 5.6 lbs. (2.5 kg) of Munich dried malt extract. Soak the crushed Carafa® in a small grain bag as the water heats up to a boil. Off heat, stir in the extract just prior to hitting a boil and stir until fully dissolved then bring the wort to a boil. Follow the remaining instructions from the all-grain recipe.

## DREW'S MARCH BEER

(5 gallons/19 L, all-grain)  
OG = 1.055 FG = 1.013  
IBU = 21 SRM = 10 ABV = 5.5%



### INGREDIENTS

8.8 lbs. (4 kg) Weyermann Munich malt (6 °L)  
3.3 lbs. (1.5 kg) Weyermann Pilsner malt  
3.4 AAU Tettnanger pellet hops (first wort hop) (0.75 oz./21 g at 4.5% alpha acids)  
1.6 AAU Hallertauer Hersbrucker pellet hops (40 min.) (0.3 oz./8.5 g at 4.5% alpha acids)  
2.25 AAU Hallertauer Hersbrucker pellet hops (20 min.) (0.5 oz./14 g at 4.5% alpha acids)  
Wyeast 2308 (Munich Lager), White Labs WLP820 (Oktoberfest/Märzen Lager), or Mangrove Jack's M76 (Bavarian Lager) yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

This is a single infusion mash. Heat 18.2 qts. (17.2 L) of water, add 1 tsp. of calcium chloride. Mash grains for 60 minutes at 153 °F (67 °C). Sparge with enough water to collect 6.5 gallons (25 L) of wort in the kettle. Bring wort to a boil and boil for 60 minutes, add hops according to the recipe above. Add a kettle coagulant of your choice if you so desire.

After the boil is complete, give the wort a long stir to create a whirlpool and let settle for 10 minutes, then begin to chill. Bring down to yeast-pitching temperature, aerate the wort, and pitch the yeast. Ferment between 48–56 °F (9–14 °C). Ferment for 2 weeks at this temperature then raise temperature to low 70s °F (21–22 °C) and hold for 2 days. Transfer to a secondary and lager for 1–4 weeks at 33–35 °F (0–2 °C). Bottle or force carbonate per normal.

**Extract brewers:** Swap out the Munich and Pilsner malt with 4 lbs. (1.8 kg) of Munich dried malt extract and 2 lbs. (0.91 kg) of Pilsner dried malt extract. Heat water up towards a boil. Off heat, stir in the extract just prior to hitting a boil and stir until fully dissolved.

Follow the remaining instructions from the all-grain recipe.

## RESPECT THE GOAT BOCK

(5 gallons/19 L, all-grain)  
OG = 1.063 FG = 1.015  
IBU = 27 SRM = 14 ABV = 6.3%



### INGREDIENTS

13.5 lbs. (6.1 kg) Best Malz Best Munich malt  
0.25 lb. (113 g) melanoidin malt  
2 oz. (57 g) Weyermann Carafa® Special II malt  
7.5 AAU Magnum pellet hops (60 min.) (0.5 oz./14 g at 15% alpha acids)  
White Labs WLP833 (German Bock) or Wyeast 2206 (Bavarian Lager) or SafLager S-189 yeast  
¾ cup corn sugar (if priming)

### STEP BY STEP

This is a single infusion mash. Heat 20.8 qts. (19.7 L) of water, add 1 tsp. of calcium chloride. Mash grains for 60 minutes at 155 °F (68 °C). Sparge with enough water to collect 6.5 gallons (25 L) of wort in the kettle. Bring wort to a boil and boil for 60 minutes, add hops according to the recipe above. Add a kettle coagulant of your choice if you so desire.

After the boil is complete, give the wort a long stir to create a whirlpool and let settle for 10 minutes, then begin to chill. Bring down to yeast-pitching temperature, aerate the wort, and pitch the yeast. Ferment between 48–56 °F (9–14 °C). Ferment for 2 weeks at this temperature then raise temperature to low 70s °F (21–22 °C) and hold for 2 days. Transfer to a secondary and lager for 1–4 weeks at 33–35 °F (0–2 °C). Bottle or force carbonate per normal.

**Extract brewers:** Swap out the Munich malt with 6.8 lbs. (3.1 kg) of Munich dried malt extract. Soak the crushed melanoidin and Carafa® in a small grain bag as the water heats up to a boil. Off heat, stir in the extract just prior to hitting a boil and stir until fully dissolved. Follow the remaining instructions from the all-grain recipe.



# TECHNIQUES

but you don't necessarily need to ferment in the 50s °F (10–15 °C) either. Denny has had great luck pitching both aforementioned (Wyeast 2124 or Saflager W-34/70) in the low- to mid-60s °F (high teens °C). Hold the fermentation at that temperature for a week or two, then raise the temperature to the low-70s °F (low-20s °C) to complete fermentation before crashing to 33–35 °F (0–2 °C) for conditioning/lagering. Hold that temperature for at least a week (more is better). You'll be amazed at how quickly you can have a great lager ready to drink.

## FERMENTING OUTDOORS IN COLD WEATHER

If you're one of the people who live where it gets cold in the winter (Drew has no idea what this means!), then you can do traditional lager fermentation outdoors. This is the way Denny made lagers for many years before getting a chest freezer and other means of temperature control. Put your fermenter in a large tub of water. Put a 50–100W aquarium heater in the water. You need to play around a bit with the thermostat on the heater in order to discover what water temperature relates to what fermenter temperature, but you get it figured out pretty quick. Denny even used a timer for the heater so it would only come on during the coldest parts of the day. In addition, should you need to cool your fermentation down you can simply add ice packs to the water. Inexpensive, effective, and above all, easy. Not as easy as a chest freezer, but several hundred dollars cheaper!


Ok, now you've all the pieces in place to brew a solid la-

ger, so let's talk a little about some of our favorite fall lager beer styles.

## OUR FAVORITE FALL LAGERS

**Dunkel** – A beautifully toasty dark lager with just enough malt to make you feel enveloped ... but not overwhelmed. It's the ideal showcase for great Munich malt. Some folks say it's an old man's beer and you should be enjoying a helles or Pils, but I'll take a dunkel any day thank you very much.

**Märzen** – Yes, it's called March beer, but in reality, this is the fall classic. Originally brewed strong as a way to get around the lack of summer brewing, Märzen has become inextricably intertwined with the Munich Oktoberfest. (Nevermind that at the fest these days they mostly drink a souped-up helles called festbier.) Amber in color when compared to dunkel's darker tones, it's actually fairly hearty. And it's perfect for a liter at a time and a warm welcome to the fall.

**Bock** – Safe to say that no lager calls to mind fall and winter seasons as much as a bock. This is probably the one style of beer that would be hard to envision ever being "IPA-ified." This is the essence of malt with just enough alcohol behind to be warming without being an overpoweringly boozy sugar bomb. Leave the doppelbock for the deepest darkest days of winter when you reach for a barleywine or Russian imperial stout. In other words, bock requires a deft threading of richness and drinking. 

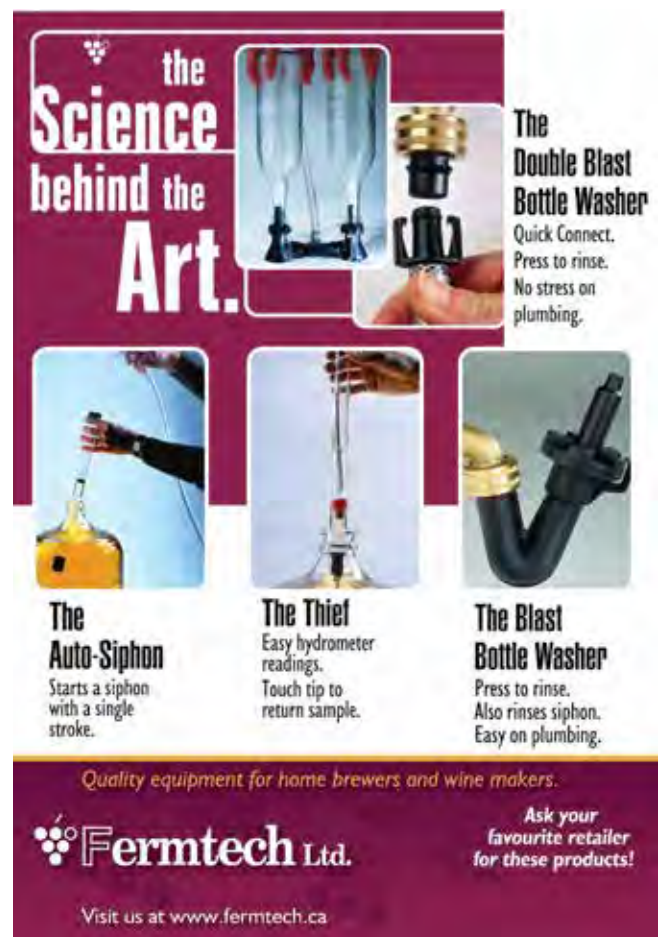


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## CHARGED UP!

### Shocking facts about electricity in the brewery

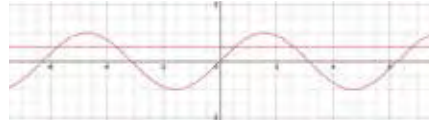
**M**any brewers choose to brew outdoors on gravity-fed systems using gas and need no electricity. However an increasing number of brewers are choosing to convert some or all of their operations to electricity. There are several advantages of heating with electricity such as lack of noise and exhaust fumes. Also electricity can run a pump so you don't have to rely on gravity.

But before you run out and drop a bunch of money on a shiny new kit, you should learn some things about electricity and enough theory to verify your safety. This overview is not intended to be a substitute for having a qualified electrician pull a permit and wire your equipment; however, it will give you an idea as to what is needed and why.

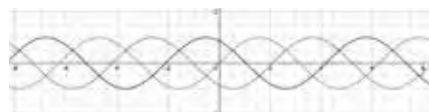
What is electricity? In short, it's the movement of electrons across a conductive material. Until the first electrical power distribution grids appeared in the 1880s, its use was mostly confined to laboratory experiments. The most conspicuous part of the grid is the ubiquitous utility pole carrying overhead power lines. Those power lines are the delivery system of electrical currents from the factory (power plant) to the consumer. In the power plant there are generators that convert stored energy (hydraulic, geothermal, solar, wind, coal, etc.) into electrical energy. The stored energy is used to provide the power necessary to rotate a very large magnetic rotor around a copper winding. As the magnetic rotor spins, electrons begin to flow through the winding, and electricity is generated. At the other end of the system is you, the consumer.

Early experiments with electricity were conducted with simple chemical batteries. Scientists also learned that electricity could be generated with the magnetic field generator described above. Nikola Tesla's experiments led

him to develop an alternating current (AC) power distribution system that could transmit electrical power very long distances without the voltage drop problems inherent to transmitting direct current (DC) power over long distances. Today, our homes and business are supplied with AC power. Typically, homes and offices are wired with single-phase power and industrial buildings are wired with three-phase power.



Graph 1: Voltage vs. time for DC and single-phase AC. DC is flat over time and AC oscillates between positive and negative voltage.



Graph 2: Voltage vs. time for three-phase AC. Each line represents one phase. The timing of each phase is 120° apart from the other phase.

There are a few key terms that need to be understood when discussing electricity. Current is the flow of electrons through a conductor and is measured in Amperes (A). Resistance is the opposition to current flow, and is measured in Ohms ( $\Omega$ ). Voltage is used to measure the difference in electric potential between two points along a conductor and expressed as Volts (V). Finally, power is a measurement of how much work is being done and is measured in Watts (W). This leads us to the two equations that solve most of the electrical calculations we will run into.

$$V = IR$$

$$P = I^2R$$

Where,  
 V = Voltage in Volts  
 I = Current in Amperes  
 R = Resistance in Ohms  
 P = Power in Watts

There are several advantages of heating with electricity such as lack of noise and exhaust fumes.



Two common types of switches found in electrical brewing systems. A mechanical contactor is on the left and a solid-state relay with heat sink on the right.

We can rearrange these equations to calculate different measurements with a little algebra. I only have two memorized, so I use this handy cheat sheet:

| If we want Volts | If we want Resistance | If we want Current | If we want Power |
|------------------|-----------------------|--------------------|------------------|
| $V=IR$           | $R=V/I$               | $I=V/R$            | $P=RI^2$         |
| $V=P/I$          | $R=P/I^2$             | $I=P/V$            | $P=IV$           |
| $V=\sqrt{(PR)}$  | $R=V^2/P$             | $I=\sqrt{(P/R)}$   | $P=V^2/R$        |

With this understanding of fundamental electrical terminology, we can shift the discussion to electrical safety. Electrical power used for brewing is no joke. It can start fires, cause severely injure, and even kill you (and others). Before setting up an electrically-powered brewery in your home, you must make this is your primary focus. In our case, safety means two things: Protecting people against electrical shock hazards and protecting your property against fire hazards.

Protecting people from shock hazards involves making sure people can't touch a live high voltage circuit and making sure if the circuit connects (shorts) to ground (e.g. the control box, the brewstand, or a kettle), there is a mechanism to shut the power off before it can cause an injury. The first job is provided by shielding the circuit with suitable insulators like the jacket of a wire and by using an enclosure to protect the connections.

To shut the power off when a wire touches something it shouldn't, we use a two-pronged approach: Grounding and protective devices. Grounding means providing a low-resistance path to the building's ground. In practice, every single conductive (metal) element in your brewery must have a solid connection to ground. To test, use an ohmmeter with one probe connected to the incoming ground (green) wire and touch the other probe to all of the metallic parts of your brewery. There should be zero Ohms of resistance at every test point. If not, the part isn't properly grounded and needs to be fixed before you turn the power on!

To protect people from a shock we also have a device called a ground-fault circuit interruptor (GFCI). A GFCI measures the incoming current against the outgoing current and breaks the circuit if the difference is more than six milliamps (mA). 6 mA is below the level that can cause injury to people. In other words, if you grab a hot wire and 7 mA of current begins to flow through your body, the GFCI will open the circuit before it hurts you. A GFCI can open the circuit much faster than a standard breaker. Use of a GFCI is strongly recommended for all of the circuits in your brewery.

A GFCI will wear out over time so it is good to test them. Manufacturers make it easy. Push the test button and verify that the circuit shuts off. Press the reset button to make sure the power comes back on. That is all you need to do. The life expectancy of a GFCI is about 10 years. Older GFCI equipment can fail in a closed state and you would not know it had failed unless you perform the test. Newer designs are "fail safe," meaning that if it fails, it fails with the circuit open.

The next thing we need to do in high-power electrical work is protect against fire. Most of the electrical codes are in place to prevent fires. The reason for inspection is to make

sure two people checked for mistakes. The electrical code helps us figure out what size circuit breakers we need and what wire sizes we need for a given power demand (load). Let's think of an example load.

Say we have a 120V, 2000W heating element in the boil kettle. We know the Watts (power) and Volts and we want to know how much current (Amps) are required. We look up our handy equation and voila  $I = P/V$ ;  $I = 2000W/120V = 16.7A$ . Most outlets in a US home are rated at 15A. So, you cannot just plug it into a wall outlet. The circuit will need to be upgraded to support your brew kettle. The last time you went to your local home improvement store, you saw 20A-rated plugs, sockets, and breakers, right? Will a couple of cheap hardware swaps get us what we need? NO! Why, you ask? Because the wire between the breaker and the outlet is a key component. We must always choose the breaker to match the wire size. A 15A circuit is normally wired with a 14-gauge wire. For a 20A circuit, 12-gauge wire (smaller number = bigger wire) is required.

The reason for this is that smaller diameter wires have more resistance per linear foot than larger diameter wires. Resistance creates heat, and heat increases resistance, creating a runaway situation where the wire melts the insulation and can start a fire.

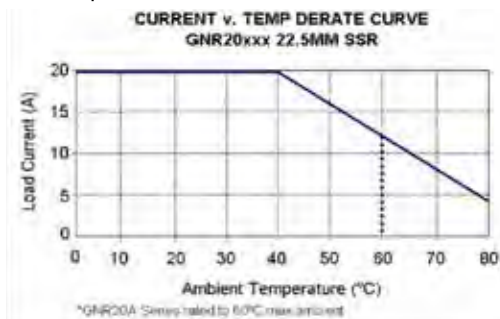
Once your wiring, sockets, breakers, and GFCI equipment is in place, how do we "turn it on" to start making some beer? The wrong way is to simply wire a plug to the wire hanging off of the element and plug it in. The socket and the plug are not designed to be used as a switch. Three kinds of switches are usually used in electric brewing rigs. The right way to turn the power on to the main system is to use a kind of switch called a contactor. To send power to the heating element during a brew, the most common device is a solid-state relay (SSR). Typically, pumps are turned on and off with a mechanical (not solid-state) relay.

Contactors use a small amount of electricity to energize an electromagnetic coil, which pulls a metal bar across the "line" and "load" terminals to switch high-current loads on and off. They can be rated for intermittent and continuous duty. For your main-power contactor, you should use one rated for continuous duty. Intermittent-duty contactors can generate a lot of heat when energized for a couple of hours during a brew. While wiring a contactor is pretty straightforward, any high current connection should be made using the correct terminals and connection practices. To select a contactor, we need to know the amount of current being switched and the coil voltage we will be using. Contactors use a wide range of coil voltages, so be careful to select the appropriate part. A mechanical contactor is ideal for things that won't cycle on and off often. The main-system contactor is a good example. You turn it on at the start of your brew day and switch it off several hours later. They are good for more than 100,000 cycles.

For process control like a recirculating infusion mash system (RIMS) when the switch may cycle on and off a lot, an SSR is the go-to choice. There are many varieties and an understanding of the varieties of SSR is important. Like a contactor, the signal voltage has to be considered in the system

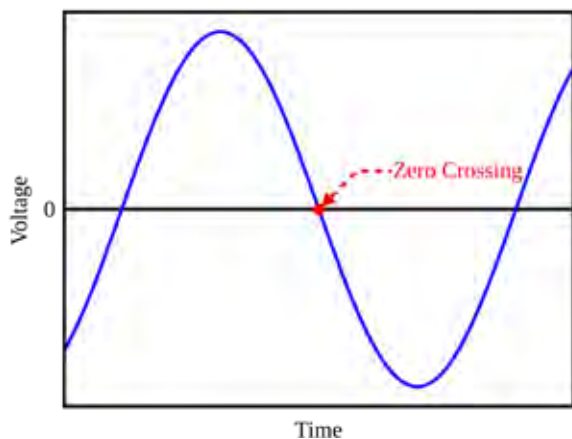


design. Unlike a contactor, an SSR makes a large amount of heat and thermal management is a big part of the design. A good rule of thumb is that an SSR will produce 1.5W of heat for every Amp being controlled. Also, as an SSR warms up its current capacity is de-rated. A 20A SSR might be good for 20A at room temperature but it quickly heats up and at 110 °F (43 °C) will need to be de-rated according to the datasheet. The use of large heat sinks helps minimize the de-rating necessary. Mounting an SSR to a large heat sink or a heat sink with a fan is important for thermal management. Calculating the proper size heat sink is not a trivial task and buying a matched set might be in order. A thermal compound or pad is used to help conduct the heat from the SSR to the heat sink.



Graph 3: Example of an SSR temperature de-rating curve. Graph is courtesy of Crouzet.

In addition to current capacity and signal voltage there are other things to consider when selecting an SSR. Most AC SSRs will be of the “zero-crossing” type. This means that after getting the signal the SSR waits until the AC voltage is crossing the zero point before switching. If we are controlling the heating element in a RIMS tube, a zero-crossing SSR is a straightforward component to use with a proportional-integral-derivative (PID) controller.



Graph 4: A zero-crossing type SSR waits for voltage to be zero before switching the power on or off.

To adjust the power to a boil element, we need to generate a current proportional to the power needed and not simply full-on or full-off. A proportional SSR is the right tool for that job. A proportional SSR will take a variable input, like 0 to 10V (DC), and create a proportional AC current output across the main terminals. They work by turning on the power a little past the zero crossing mark and then turning it off again a little before. The amount of time it shaves off the sine wave adjusts the power. This is called “phase angle control.”

Even though these turn the power on and off at 120 times per second they are very reliable. Normally for a boil kettle or a distillation head, the voltage is set with a DC power supply and a potentiometer controlling the trigger signal. Some components will even have an internal supply to reduce the total number of components in the system.

A proportional SSR is also the best choice for a PID controller in a RIMS set up. In this application, the PID uses a temperature sensor and some math to keep the controller from overshooting the set-point temperature. It also keeps the temperature from bouncing up and down around the set point (hysteresis). Tuning a PID is system-dependent and can be a little tedious. Most people will use an auto tune on the controller and make small adjustments from there. Once tuned, the PID controller sends a variable signal to the SSR to set the power to the right level. Mash temperatures can then be repeatable and consistent from batch to batch.

Electric elements are available in many varieties. The important parameters to consider are power, power density, and coatings. We need enough power to boil vigorously enough to drive off Di-methyl Sulfide (DMS). As a quick guide you will need approximately 1800W for a 5-gallon (19-L) boil, 4500W for a 10-gallon (38-L) boil, and 5700W for a 20-gallon (76-L) boil. This depends a lot on geometry, ambient temperature, and insulation.

The power density is the ratio of the element surface area to the power. If it is not published, you will need to measure the diameter and the length to calculate area. Since some elements are folded it can be tedious to get an accurate length.


$$\text{Area} = \text{Diameter} \times \text{Length} \times \text{Pi}$$

$$\text{Watt Density} = \text{Power}/\text{Area}$$

Most hardware-store water heater elements are > 50W/in<sup>2</sup> (8W/cm<sup>2</sup>). At these high power densities of scorching of the wort could occur. Elements are available at < 25W/in<sup>2</sup> (4 W/cm<sup>2</sup>). These have minimal flavor and color impact, equal to a direct fire system. Brewers have found that having a power density of < 30W/in<sup>2</sup> (5W/cm<sup>2</sup>) is a solid choice.

Finally, the first experimenters in brewing with electric elements were using uncoated high-watt density elements from water heaters. While they were able to make beer, it was quickly noticed the wort was getting scorched and the elements had a short life. Stainless elements with special coatings are now common in the marketplace.

Whatever you decide to do, please take the time to do proper research first! Consult with a licensed professional electrician or electrical engineer to make sure that every aspect of your system is safe. Any modifications to the electrical system in your house will require a permit and the services of a licensed electrical contractor. Failing to bite this bullet can result in fire or injury, and result in large fines and a huge expense to meet local codes.

There are a lot of very good resources out there to help select the equipment and design to match your brewing style. The Electric Brewery at <http://shop.theelectricbrewery.com> and Homebrew Talk's Electric Brewing sub-forum are both great places to start. 



## ROOT OUT DEFICIENCIES

### Common missteps for nanobreweries

Most of these lessons are from an owner's perspective, and because the head brewer for a nano is often the same person, consider these positions interchangeable.

Over the past decade I've worked with dozens of nanobreweries in an operational audit capacity. Combining my public accounting audit background with my Six Sigma lean manufacturing training, I've custom tailored audits for breweries of all sizes. This allows me to pinpoint inaccuracies, inefficiencies, and omissions within each entity's operations: From their financial statements and production flow to their communications strategy and company culture.

If opening a nano has been on your mind, I wanted to share with you some of the most common deficiencies I've seen over the years, reasons they're deficiencies, and some preventive measures/suggested solutions before you have a chance to encounter them yourselves. My goal is that you'll recognize the importance of planning, designing, and executing standard operating procedures (SOPs) consistently, and how so many of their elements are correlated to the entity's eventual success (or failure). I'll list the deficiency first in italics, explain why it's a deficiency second, and then finish with suggestions to prevent/alleviate the deficiency. This follows the general format of most of my operational audits. Most of these lessons are from an owner's perspective, and because the head brewer for a nano is often the same person, consider these positions interchangeable. Let's get started.

#### *Little production planning*

In many cases I see, the planning window is only 1-3 weeks. This is not okay. Production planning allows the brewer to create a sales forecast for the year (broken down by quarter). Production efficiencies can be realized based on production plans, helping avoid such situations as overnight shipping fees or carrying high ingredient inventories.

Production planning allows the brewer to aggregate raw materials orders for optimal pricing, to minimize the opportunity for raw materials shortages, and to handle yeast management and residence times more effectively. This can become a pain point for a team, resulting in a significant amount of frustration and flustered communication.

Build a production forecast for the upcoming 12 months with the head brewer. The brewer should negotiate raw materials pricing for this period based on expected order quantities. The brewer should calculate optimal order times and optimal reorder points for this lead time. After a quarter of running operations following production plans, implement, then integrate an inventory management system and allow the software to complete the planning for you. The key is to initiate a SOP first, then apply good practices to software operations. On the brewing side, calculate yield losses for the prior year then plan for a reduction in those yield losses for the upcoming 12 months. Create processes that would bring about those efficiencies. Finally, implement an annual budgeting process for the overall operation using a combination of a top-down and bottom-up approach, depending on the degree of transparency you are willing to share with anyone who is a part of your operation.

#### *No regular purchase order process*

This implies inventory is potentially received without being counted. The bill of lading and packing slip are essentially ignored. If (or when) the invoice arrives, it is input without regards to timing. The brewer or staff can order any amount or any type of ingredient they want or need without any sort of internal controls. Someone on staff could steal bags of grain or other



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materials for their personal use without being caught. Cost of goods could be stated improperly. There is no way to accurately cost out each run of beer. The brewery could be paying for incorrect inventory or be shorted inventory by the vendor without their knowledge. On the sales side, packaged product could be stolen without owners' knowledge. Inventory could be shorted or over-allocated. In short, this lack of a single procedure can cost the brewery unknown amounts of money.

When an order for inventory needs to be placed, assign it a purchase order number. The order should indicate quantity and price per unit. Once inventory arrives, match quantity to purchase-order quantity and indicate any shortages. Once the invoice arrives, match price to amount agreed upon in purchase order prior to in-putting into the financial system. Input inventory quantities into financial records as it arrives to ensure inventory quantities are correct and just-in-time. Brewer should have access to unit costs to allow for negotiations with suppliers. Brewer or owner should maintain a recipe costing template to track true beer costs per run until good practices are achieved and the software takes over that work calculation. See my "Crunching the COGS" column in the January-February 2019 issue for more on this. Several of my nanobrewing clients have adapted the following SOPs with success. Note that this is an example only and other ones may exist.

Treat the taproom as a client of the brewery and create a sales order by the taproom at cost (price equals cost) to document the inventory transfer from one location to another. If the keg is a partial, indicate on the sales order an approximation of quantity of beer being transferred in the keg. On the taproom side, keep a board or paper at the bar by brand and package size. Every time a keg is changed out, mark a hash tag next to the brand/package size. On the last day of each month, tie the hash tags out to the monthly taproom "invoice" the owner creates to ensure the appropriate amount of kegs have been transferred. The taproom manager (if there is one) is responsible for reconciling variances.

Once these processes are in place, implement inventory management software to input all this information digitally versus on paper. The key is to initiate operating procedures first to ensure data is being captured accurately and completely before relying on software to complete what was previously done manually.

#### ***Physical inventory not taken at the end of month***

Valuable cash and resources may be squandered due to variances and shortages. If no one is held accountable for the shortages, there is no incentive to improve operations. Inventory could just "walk out." The brewer may run out of a raw material they may need, which could interrupt operations and cause conflict between coworkers. The brewery cannot improve loss figures if it doesn't measure them to begin with.

Have a designated individual complete a physical inventory on the last day of each month after operations have concluded or on the first day of the month prior to operations commencing for all inventoried items. Submit count sheets to owner (if that individual is not the owner) to input adjustments into your inventory or financial management

system, even if it's just Excel. Run a variance report and have the owner analyze it on a monthly basis. Hold accountable those in charge of specific responsibilities to investigate and explain inventory variances. Once a high degree of accuracy (counted versus what's in financial records) is achieved on a monthly basis, consider a transition to cycle counts based on total inventory value.

#### ***No inventory tracking for brewing and packaging processes***

If processes are not measured then action plans cannot be instilled on measured losses. Aside from reasons mentioned earlier in this column about lack of inventory tracking, the TTB requires a brewery to maintain inventory and production logs for every stage of the brewing process. A greater amount of detail on the TTB requirements for inventory and recordkeeping may be found here: [https://www.ttb.gov/beer/beer-tutorial.shtml#\\_Production\\_and\\_Inventory](https://www.ttb.gov/beer/beer-tutorial.shtml#_Production_and_Inventory).

Implement inventory management software that overlays on top of your financial management system. Set up bin locations for inventory to instill a rhythm to inventory management and tracking. Some examples of inventory management systems fitting a nano operation include Ekos Brewmaster and VicinityBrew. If the owner is skilled with Excel, he/she could potentially create an inventory management workbook, but this would also require daily journal entries. I've created an Excel workbook before for a 5,000 BBL brewery and while the daily entries weren't difficult to input, the entire task is time-intensive and tedious. Some of my nano clients choose to keep up with their Excel workbook on a daily basis, while others choose to spend their time elsewhere and pay the \$200 monthly fee typical of these types of systems. It depends on how you value your time, and whether you have others available to assist.

#### ***Lack of a back-up (succession) plan***

What happens if a key position abruptly quits or goes missing? This is a glaring deficiency for many nanos due to their size. Brewery operations could abruptly halt, resulting in lost revenue, quality loss in product, and internal fighting.

Everyone should be cross-trained into at least one other related position. Create a communication plan detailing who does what in case a key role goes missing. Develop a succession plan to keep each other motivated and energized, fueled by growth opportunities. Define each role explicitly in written form. It keeps people accountable.

On the other hand, if the nano is a one-person operation and serves as a hobby job for the brewing owner, the termination of operations may not be significant and a succession plan may not be applicable.

#### ***Kegs not tagged to account for cooperage losses***

Kegs can have a way of disappearing if not accounted for. Treat keg shells as inventory items and include them in your regular inventory counts. If possible, tag them with coded sticker tags or laser etchings and track cooperage in stages: Dirty, clean, filled, and in-market. Assign keg tracking to one specific individual. Reconcile counts on record to physical inventory and be prepared to explain all variances.





# NANOBREWING

## Tips should NOT be included in taproom income

If tips are being included, taproom income will be overstated, giving the owner an inappropriate view of operational health for future planning. Since income is being overstated, sales and use tax will be overstated, and this simple fact will lead to decreased profits.

The nano should follow a similar format as a memorized daily journal entry. The actual journal entry is subject to point-of-sale reporting format. An example of the journal entry as an example follows:

- Debit: Cash on hand for cash payments received
- Debit: Taproom discounts and refunds
- Debit: Undeposited funds for credit card payments received
- Debit: Merchant service fees for payment gateway
- Credit: Cash on hand for tips paid out
- Credit: Sales and use tax payable
- Credit: Sales taproom beer
- Credit: Sales other beverages
- Credit: Sales restaurant (or food) – \*if applicable\*
- Credit: Sales merchandise

Following this journal entry, a daily reconciliation of petty cash should be performed to ensure the cash drawer isn't being shorted. Cost of Goods Sold categories should be set up in the chart of accounts to match revenue categories in order to monitor gross margins by category. Overhead labor rates should be assigned once margins have been benchmarked.

## Sales tax collected should NOT be reported as taproom income

Sales tax collected from a customer is a balance sheet versus income statement transaction. Taxes will be overpaid on the portion of sales tax collected and net income decreased.

Set up a sales tax payable account in the balance sheet and deposit all sales tax collected into that account. Debit that account on a monthly basis when sales tax is paid. The journal entry follows.

When sales tax is collected from daily sales:

- Debit: Cash on hand
- Credit: Sales tax payable


When sales tax is paid to the state monthly:

- Debit: Sales tax payable
- Credit: Cash on hand

Note that the sales accounts are never touched. This format coincides with the previous daily taproom journal entry.

## Final Thoughts

The size of your operation should not be an excuse for poor business practices. Each position's role at the nano should be explicitly defined alongside a clear path of communication. A communication plan should be reviewed on an annual basis. As our industry is highly regulated, ignorance is not an excuse. Make sure you spend enough time with your planning, understand your working capital requirements, and use the data from your systems to make smart business decisions.

Hope is not a strategy. 



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# THE INDOOR/ OUTDOOR BREWERY

Don't let a wall stop you

**L**ike so many homebrewers, I started off several years ago by brewing 5-gallon (19-L) extract batches in my kitchen. When it was time to step up to all-grain brewing and 10-gallon (38-L) batches, I was faced with several options: 1) I could set up a brewery in my filthy, too hot/too cold garage with no plumbing, 2) I could drag everything out to my yard and back inside again and be completely at the mercy of the elements, or 3) I could set up a full brewery in my basement. The third option would require a heavy-duty exhaust fan system to remove the 1–2 gallons (4–8 L) of moisture from the boil-off, the overpowering hops smell (which my family doesn't care for), and the carbon monoxide (CO) from high-power gas burners. And I was told by more than one contractor that an exhaust system would create negative air pressure in my basement, which would pull in dangerous radon gas (welcome to New Jersey!). I could eliminate the CO problem by having an electrician run 240 V lines for a full electric brewery, but that would still leave me with the moisture, smell, and radon issues.

As none of these three options were particularly attractive to me, I racked my brain to come up with an alternative: How about an indoor/outdoor brewery?! Why not mash and ferment in the comfort of my climate-controlled finished basement, then conduct my hour-long boil with a

high-powered gas burner in my backyard? Since I didn't have a conveniently located window (for those that do, you could just run a hose through it), all I needed for this plan to work was the willingness to drill a ½-in. (15 mm) hole in the back wall of my house to install a copper transfer pipe with the appropriate fittings and quick disconnects. So if you don't have a window, or if you want to keep insects and the heat/wind/cold out of your house while brewing, or if you simply prefer a more clean solution, then this project may be for you.

I collect my wort in a grant (I use an insulated beverage cooler) instead of a boil kettle. Once all the wort is collected in the grant, I pump it through the wall pipe and out to the kettle. When the boil is over, I pump (or just use gravity) the wort from the kettle, back through the wall pipe, and into the fermenter. This setup has allowed me to brew year-round in relative comfort, and at a great price. If you already have all of the other brewing equipment, the cost of the wall pipe itself, with camlock fittings, is less than \$20!

As a recent upgrade (optional but highly recommended), I purchased a wireless BBQ thermometer with a temperature alarm. I attached the stainless steel temperature probe to the kettle using a compression fitting and some small O-rings, so I can monitor the kettle temperature from my basement to avoid boil-overs.

## Tools and Materials

- 1 ft. (30 cm) of ½-in. (15-mm) copper pipe
- (2) ½-in. (15-mm) copper x FPT adapters
- (2) ½-in. (15-mm) MPT camlock fittings
- Pipe soldering equipment (solder, flux, torch)
- Teflon tape
- Epoxy putty
- ½-in. (15-mm) drill bit (masonry or wood)
- Electric drill (hammer drill preferred for masonry)
- A brewing pump (if you don't already have one)
- Wireless remote digital thermometer (optional)
- Probe compression fitting ½-in. MNPT x ¼-in. probe (optional)

Why not mash and ferment in the comfort of my climate-controlled finished basement then conduct my hour-long boil with a high-powered gas burner in my backyard?



Photos by Brian Budris

## STEP BY STEP

### 1. CHOOSE A LOCATION FOR THE WALL PIPE AND CUT PIPE TO LENGTH

You will want to pick a location that's near a water and/or natural gas source inside, with a level spot outside for your kettle burner. If you don't have a paved surface outside, you may want to buy a large patio block paver for the burner to rest on. I installed my pipe approximately 1 ft. (30 cm) above exterior-ground level, through the concrete block basement wall. Cut the pipe approximately 4 in. (10 cm) longer than the thickness of your exterior wall to allow for a 2-in. (5-cm) protrusion on either side.

### 2. DRILL A HOLE THROUGH THE WALL

Drill a ½-in. (15-mm) hole through the exterior wall of your house using a hammer drill and a ½-in. (15-mm) masonry drill bit. I drilled my hole as level as I could, but if I had to do it again, I would have drilled it at a slight angle to allow the pipe to drain better. If you are running the pipe through a wood frame wall, use a wood drill bit. Make sure that you don't hit any plumbing or electrical lines inside the wall!

### 3. ATTACH THE INTERIOR FPT ADAPTER AND INSERT PIPE THROUGH THE HOLE

Solder on the interior FPT adapter prior to inserting the pipe through the hole. If your interior wall is finished, you may want to slide a trim ring onto the pipe before running it through the wall. If the pipe does not go through the wall easily, you may need to try to slightly enlarge the hole or else cover one end of the pipe with a wood block for protection and tap the block with a hammer.





#### 4. ATTACH THE EXTERIOR FPT ADAPTER AND CLEAN THE PIPE

Solder the exterior FPT adapter onto the outdoor end of the pipe. Clean the flux from the inside of the pipe using soap, water, and a tube brush.




#### 5. SEAL AROUND THE PIPE

If you ran the pipe through a masonry wall, use epoxy putty to seal around the pipe and hold it firmly in place. Roll the putty between your hands to form a tube, wrap it around the pipe at the wall, and press in place with your fingers. If you ran the pipe through a wood frame wall, you will want to caulk around the pipe and hold it in place by attaching a right angle bracket to the wall on either side of the hole and clamping it to the pipe with a hose clamp.



#### 6. SCREW ON THE MALE CAMLOCK FITTINGS

Wrap the threads with Teflon tape and screw a male camlock fitting (other quick connect fitting) into both of the FPT adapters. You will now be able to easily attach transfer hoses to both ends of the pipe. You may want to purchase a couple of small buckets to hang from either end of the pipe as drip catchers (a set of three 1-qt./1-L galvanized buckets with handles is available online for around \$15). You may also want to purchase a couple of camlock caps or covers from [Brewhardware.com](http://Brewhardware.com) to keep hot/cold air and insects from entering your house through the pipe when not in use. 



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## BYO BUSINESS CARDS

### Combine homebrewing and networking

... someone in his group will frequently tell him they don't like beer, but they still enjoy the process and usually end up finding a style they like.

I'm no stranger to non-traditional business networking. I've done yoga and networking. I've done painting and networking. I've even sung in a choir of legal professionals for the sake of building my network. Why not networking and homebrewing?

To learn more, I reached out to Maia and Warren Wilson of Homebrew University in Hackettstown, New Jersey. Warren is the owner and brewmaster. Maia is the events coordinator. She organizes networking events at the HU for businesses and organizations like the local chamber of commerce.

If you'd like to organize a business event at your local homebrew supply shop or in another space, here are some considerations:

#### Match group size to the purpose

Before you send out the invites for a brewing/networking event, consider the size of the facility and whether your group will be able to brew one or more batches. If your clients or co-workers will all want to take an active role, limit the number to about 15 people per batch. "If, however, your focus is more about gathering people together to network around a beer-related event," Maia says, "you are only limited by how many people fit comfortably in the space."

#### Appoint a few people to do certain jobs

Before you begin, choose a couple of point people. "A watched pot never boils, but an unwatched pot boils over," says Warren. At Homebrew University, participants are divided into teams for weighing and milling, stirring, hop additions, cooling, and yeast pitching, along with all of the clock watching and temperature taking that goes with each role. Having specific roles for team members ensures all jobs get done and no one gets left out.

#### Collaboration = connections

Colleagues and contacts can get to know one another over the common goal. Harry Browne, a financial advisor, homebrewer, and President of the Mount Olive Area Chamber of Commerce in New Jersey, takes a "Business over Beer" group to Homebrew University at least once a year. He recommends, "Keep it light and don't get sales-y." His group connects during the brewing downtime. "We encourage folks to sit down and talk," he says. Talking about the brewing project everyone is doing will help avoid awkward small talk and give everyone in the group at least one thing in common.

#### Prepare your newbie brewer colleagues

You can build connections by helping the newbie brewers in your group prepare. When you're choosing a venue, ask about the information they provide to new brewers. Even before the session, you can chat with your colleagues about styles and suggest a few samples they could try. Browne notes that someone in his group will frequently tell him they don't like beer, but they still enjoy the process and usually end up finding a style they like.

#### Bottling is another chance to connect

About two weeks after the brew session, your team can pick up their brew. Browne's group gets together the following month to taste the end result. You get two chances with your contacts, he says, once during the brew and once for the tasting. Warren says creating a bottle label for your team, company, or event can help clients remember the experience — and your company. "Everyone gets to walk away with a prize."


Maybe you and a new client will connect over the brewing experience more than you would over lunch. 



Photo courtesy of Harry Browne

Homebrew University in Hackettstown, New Jersey brings the hobby of homebrewing to the business world to help professionals with a business networking experience or a team-building exercise.

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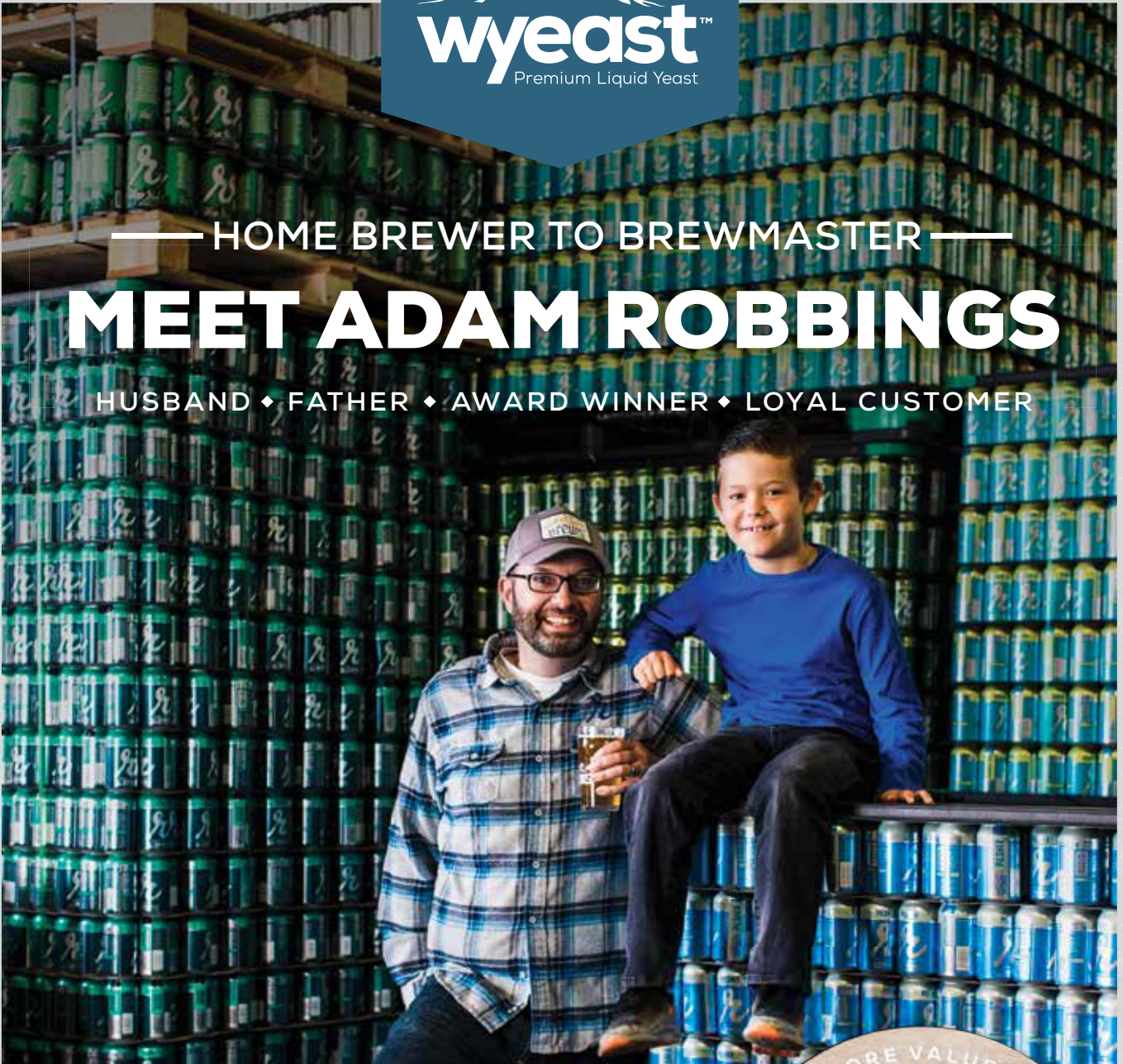




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