BREWING SUPER SAISONS | LATE HOPPING LIKE A PRO | FALLING FOR BELGIAN BLONDS

BrewYour Own

THE HOW-TO HOMEBREW BEER MAGAZINE

MAY-JUNE 2013, VOL.19, NO.3

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CONTENTS

May-June 2013 Volume 19 Number 3

features

departments

where to find it

RECIPE INDEX

BYO RECIPE STANDARDIZATION

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

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what's happening at BYO.COM

Make the Most of Your Mash

So you've got the basics of single infusion mashing down? Where do you go from there? Learn the variables that have the biggest impact on your finished beer as well as some of the practical aspects of being an all-grain brewer.
www.byo.com/story1130

Brew a Hennepin Clone

If you are looking for more saison recipes like those that start in this issue on page 32, try brewing this clone of Brewery Ommegang's Hennepin — a classic example of an American saison.
www.byo.com/story1778

Create Your Own Recipe

A lot of brewers want to reproduce a commercial favorite. Other brewers set their sights on winning competitions and wisely know that fulfilling the judges' expectations is often more important than brewing to their own tastes. Here's how to go about making your own homebrew recipes.
www.byo.com/story515

Cover Photo: **Charles A. Parker**

Brew Your Own — The How-To Homebrew Beer Magazine

EDITOR
Betsy Parks

ART DIRECTOR
Coleen Jewett Heingartner

TECHNICAL EDITOR
Ashton Lewis

CONTRIBUTING WRITERS
Chris Bible, Christian Lavender, Marc Martin, Terry Foster, Glenn BurnSilver, Kristin Grant, Forrest Whitesides, Jamil Zainasheff

CONTRIBUTING ARTISTS
Shawn Turner, Jim Woodward, Chris Champine

CONTRIBUTING PHOTOGRAPHERS
Charles A. Parker, Les Jörgensen

◆

PUBLISHER
Brad Ring

ASSOCIATE PUBLISHER & ADVERTISING DIRECTOR
Kiev Rattee

ADVERTISING SALES COORDINATOR & RECIPE EDITOR
Dave Green

EVENTS & MARKETING COORDINATOR
Jamell Kristiansen

BOOKKEEPER
Faith Alberti

SUBSCRIPTION CUSTOMER SERVICE MANAGER
Linda Marlowe

NEWSSTAND DIRECTOR
Carl Kopf

SUBSCRIPTIONS ONLY
Brew Your Own P.O. Box 469121 • Escondido, CA 92046
Tel: (800) 900-7594 • M-F 8:30-5:00 PST
E-mail: byo@pcspublink.com • Fax: (760) 738-4805
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EDITORIAL & ADVERTISING OFFICE
Brew Your Own
5515 Main Street
Manchester Center, VT 05255
Tel: (802) 362-3981 Fax: (802) 362-2377
Email: BYO@byo.com

ADVERTISING CONTACT: Kiev Rattee (kiev@byo.com)
EDITORIAL CONTACT: Betsy Parks (betsy@byo.com)
FACEBOOK: www.facebook.com/BrewYourOwn
TWITTER: @BrewYourOwn

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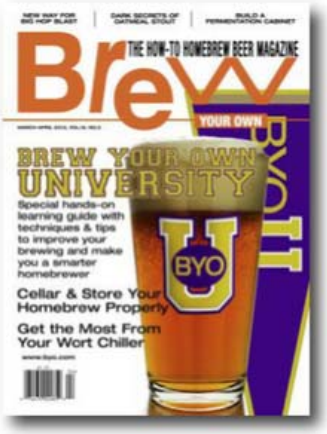
Volume 19, Number 3: May-June 2013



Why not use dry yeast for a starter?

Most experts advise using a good quantity of yeast starter, so for my next batch (extract/partial mash) I was going to make up a starter using dry yeast. But the BYO-U article in the March-April 2013 issue advised against the idea. I've been brewing with fresh extract, less than 30% dextrose, a good rehydration procedure, boil for ~30 minutes and careful handling not to oxygenate at the wrong time other than when yeast is added. But the results are disappointing, i.e. the beer tastes too yeasty. I don't recall this problem when I was doing all-grain with liquid yeast+starter. I have tried chilling the beer to let yeast drop out and there's very little sediment in the bottom of the bottle but still it tastes too yeasty. What's the single most important thing to do to get away from this yeasty taste? I'm not trying to make an authentic style of beer, just a drinkable ale with 5–6% alcohol and have it not taste like "homebrew." Where I live there's not much of a brewing community and I'd have to drive ~200 miles to get a vial of yeast, so I'd prefer to try and use dry yeast, if possible. Would GoFerm and/or FermAid help?

Joe Wdowiak
via email

There is nothing wrong with making yeast starters with dry yeast sachets, it is just unnecessary in most circumstances as a sachet contains enough yeast cells to properly ferment a 5-gallon (19-L) batch of beer. If you are using 11 g of properly re-hydrated yeast, then you are pitching roughly 230 billon yeast cells, which is a rather robust pitching rate and should serve you well until you get up above about 1.070 starting gravity. When you are pitching 6 grams of Muntons Ale yeast, you may be underpitching the beer, especially if not properly re-hydrated. You can certainly make a starter with dry yeast and experiment if you wish, but even with high alcohol beers, you can simply use a second sachet.

As far as your yeast flavor problems are concerned, it's tough to say exactly what's going on without knowing the type of yeast you are using and how much. For example, 11 grams of Lallemand's Nottingham dry yeast behaves way

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 *Brewing Better Beer: Master Lessons for Advanced Homebrewers* (Brewers Publications, 2011). He frequently contributes to *Brew Your Own*.

In this issue, on page 32, Gordon explores the French farmhouse roots of traditional saison and shares some of his favorite medal-winning saison recipes from three BJCP award winners.

Terry Foster was born in London, England and holds a PhD in chemistry from the University of London. He now lives part of every year near New Haven, Connecticut, where he often brews commercially with the brewers at BruRoom@BAR — New Haven's first brewpub. Terry is known to many homebrewers as the author of the *Pale Ale* and *Porter* books in the Classic Beer Style Series (Brewers Publications) as well as many articles in *Brew Your Own*.

In this issue, on page 42, he discusses the basics of base malt. And in his "Techniques" column on page 73 he discusses how to plan for flavor and aroma loss when filtering on the homebrew scale.

Justin Burnsed made the move from homebrewer to professional brewer and blogged about his time enrolled in the UC-Davis Master Brewers program and out in the real world at http://byo.com/blogs/brew-school. He is currently Partner and Brewmaster at Prospectors Brewing Company in Mariposa, California (near Yosemite National Park), which opened in 2012.

Justin is a frequent contributor to *BYO*, including previous stories about brewing hoppy, American-style ales as well as troubleshooting what to do when something goes wrong with your beer. In this issue, on page 50, he discusses making malty beers — such as Scotch ale, southern English brown, doppelbock, English barleywine and Munich helles.

differently than 6 grams of Muntons dry Ale yeast which is way different than 11 grams of Fermentis US-05. As for the yeast not dropping clear, it may be simply yeast selection. Some yeast strains flocculate a lot faster and easier than others. In the BYO *homebrewery, we have noticed that Fermentis US-05 sometimes does not want to clear, even after weeks in the kegerator. Using a clarifying agent such as Polyclar or gelatin can help the yeast to drop out of suspension in timely fashion. On the other hand, Lallemand's Nottingham and Fermentis S-04 will drop out like rocks when fermentation finishes. Water chemistry, such as calcium levels, can also affect flocculation rates. It might be a good idea to try experimenting with different dry yeast strains to see if you can solve some of your yeasty issues. Rather than making multiple 5-gallon (19-L) batches and coming up with similar results, try breaking one batch up into five 1-gallon (3.8-L) batches and pitching different yeast strains into each faction to see how each of the strains behave. This will require getting your hands on some smaller brewing vessels, but the upside is that you can do some more experimenting in the future. In fact, your yeast troubles might be a good excuse to become a bit of a small-scale mad scientist. When you find something you like, you can scale it up to a full batch. For more about brewing on a small scale, visit www.byo.com/smallscale.*

"Over The Topper" question

Hello, I'm new to brewing (1 year) and having a ball. I notice in my new issue of *BYO* that your Over the Topper (Heady Topper clone) had 13 lbs. (5.9 kg) of Pale Malt but the recipe on the website has it at 15 lbs. and the Simcoe® hops in the 30 minute hop stand have 13 AAU with 1 oz. of 5.75% alpha acid. I cultured some Conan yeast from some Heady and am looking forward to giving this beer a try.

Chris Swanson
via email

Story author Dave Green responds: Thanks for bringing that up Chris, 13 lbs. (5.9 kg) is the correct amount, not sure how the 15 lbs. (6.8 kg) made it on the website, but it was from an earlier version, which was an "oops" on my part because of not setting the table sugar up properly in the brewing calculator. The Simcoe® addition was also corrected. Thanks for catching that and letting us know. The website has now been corrected.

Best of luck with the brew, the Conan yeast should help push it to nearly being Heady. I found this recipe got me about 80–90% of the way there even without Conan. The hardest part is keeping my keezer stocked with this since everybody wants to drink this clone and nothing else. BYO

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homebrew nation

READER INK

Mark Cintula • Middle Grove, New York

I started getting interested in beer back when I was a kid, sitting on my dad's lap sipping the foam from something like Schaefer's, Ballantine three ring ale, Dobler, Utica Club — I recall not liking these flavors much, if at all. Then came a revelation, Löwenbräu Dark — oh yummy. Not really knowing much about beer, I only knew what my taste buds liked, and American lagers, and Pilsners weren't really it. Then came the day when all the microbreweriess started coming out with excellent beers. Later on I had friends who actually brewed their own beer — what a concept. So as of about two years ago I have become a homebrewer making my own tasty ales. I now have four Corney kegs of homebrew on tap at all times, as well as a temperature-controlled chest freezer that fits another six Corney kegs that are either fermenting or lagering.

Recently, I saw the "Cool Hop Guy" *Brew Your Own* magazine cover (from March-April 2005) and I thought, "What a great tattoo that would make!" Why did I want a tattoo of the "Cool Hop" guy you might ask? Well, I'm not too serious, and I like color and upbeat things in my life. I live on a mountaintop and have also lived on the ocean — I'm a sun lover, sun bum and sunny personality. As a kid I found Snoopy to be a carefree, ingenious character — nobody really owned him. I restored a 1958 Harley and it is one of two loves of my life, and will forever reside in my soul, as well as imbedded in my skin in another tattoo, as you can see in my photos (to the left). The "Cool Hop Guy" represents a sunny personality to me, too — he's fun, cool, not too serious, as well as a symbol of another part of who I am — a brewer and a fine beer drinker. I had been wanting to ink my other arm and he caught my eye, so I decided that he just had to permanently be a part of me. Someday in the future I'm thinking of adding some grains and some magical yeasts floating around all under a bright orange harvest moon to finish off the left shoulder.

byo.com brew polls

Have you ever used spent grains for cooking?

No, but I would like to 51%

Yes, but not often 26%

No, I'm not interested 12%

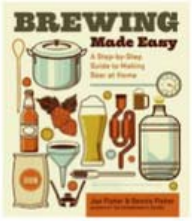
Yes, all the time 11%

we WANT you

Share your tips, recipes, gadgets and stories with *Brew Your Own*. If we use it, we'll send you some *BYO* gear! Email our editors at **edit@byo.com**

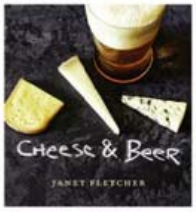
what's new?

Brewing Made Easy 2nd Edition



This beginner's guide to brewing beer at home includes everything you need to know to make your very first batch. Authors Joe and Dennis Fisher strip away the mysteries and ensure success with clear, step-by-step instructions, and they offer 25 simple recipes for a variety of beer styles. This revised edition covers the latest techniques and equipment, as well as new varieties of hops and other ingredients.
$12.95 at major booksellers

Cheese & Beer



The booming worlds of craft beer and artisan cheese meet in this first-ever guide, an introduction to the most popular craft-beer styles and the cheeses that complement them. This richly photographed reference by Janet Fletcher will help cheese enthusiasts who want to dive more deeply into craft beer, and beer fans who want to learn more about fine cheese.
$24.99 at major booksellers

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$11.95, https://pinholepress.com/products/beer-bottle-label-5-50002/

calendar

May 4
17th Annual Celtic Brew-Off
Arlington, Texas
Put on your kilts, dust off the bagpipes and heat up your brew kettles. The Knights of the Brown Bottle homebrew club invite you to participate in their annual homebrew competition, which is held in conjunction with the Texas Scottish Festival And Highland Games.
Deadline: April 4
Entry Fee: $8 per entry
Contact: Luck Ricks, ricks.luke@gmail.com
Web: www.kobb.org/celticbrewoff/

May 18
OC Fair & Event Center Homemade Beer Competition
Costa Mesa, California
Show Orange County what your homebrew is made of by entering the OC Fair Homemade Beer Competition. Some divisions are open only to Orange County residents, and some limit the number of entries and age of entrants. Check individual division guidelines for who may enter each competition. Awards ceremony announcing division winners and best of show will be held August 4 at 5 pm.
Deadline: May 3
Entry Fee: $5
Contact: Julie MacRae, j_macrae@ocfair.com
Web: www.ocfair.com/competitions

June 8
Hop Blossom Homebrew Competition
Winchester, Virginia
The Shenandoah Valley Homebrewers Guild presents the first annual Hop Blossom Homebrew Competition. This competition takes place in conjunction with the first annual Hop Blossom Craft Beer Festival. The festival is geared toward educating and exposing participants to the growing popularity and love for great craft beer.
Deadline: May 31
Entry Fee: $5
Contact: Eric Boyers
Web: http://www.valleyhomebrew.com/hop-blossom.html

homebrew drool systems

Hide-A-Draft System

Justin Polhemus • Nottingham, Maryland

In 2009, Justin installed a very inconspicuous (but extremely convenient) homebrew draft system behind a picture mounted on the wall in his kitchen. Justin has a background in professional construction, and did a great job of incorporating his kitchen's existing design with his love of cold homebrew on draft.

To the casual observer, this framed photo on the wall of Justin's kitchen is just a decoration — it is part of a series of framed photographs.

The framed photo is mounted, however, on a hinged door that conceals his four-tap draft system.

Now Justin's cold homebrews are within easy reach whenever he's working in the kitchen — no draft lines, kegerators or other equipment in sight!

beginner's **block**

FERMENTATION TEMPERATURE CONTROL

by betsy parks

As you learn to homebrew, you will hear over and over again that you will need to maintain control over the temperature of your fermentation to maintain some control over the profile of your finished beer. This is because yeast behaves differently when it ferments at warmer or cooler temperatures. There are easy ways to control the temperature of your fermenting beer, as long as you pay attention to what is going on in the fermenter.

Why control

Having the ability to control fermentation temperatures is important in your homebrewery because you need to provide your yeast with an optimal environment to ferment at its best. If it is too cold, your yeast may slow or stop. If it is too warm your wort may ferment too fast and produce off odors or flavors.

Temperature has a big impact on your beer because the yeast cells create different compounds, such as esters, and different effects at various temperatures. For example, some beer styles, such as many Belgian styles, are fermented at higher temperatures — up to 85 °F (29 °C) — because the style calls for fruity esters that yeast will create in a warm environment. Temperature control is also important when keeping things cool as well. For example, many lagers such as Pilsner, require long, cool fermentations to keep the flavor profile clean, crisp and free of fruity esters, which would be considered a flaw. The key is finding a method to control your temperatures that works in your brewery.

Location

If you don't want to buy extra equipment, the most basic method of temperature control is choosing a location in your homebrewery that is conducive to brewing yeast. Decide what kinds of beers you want to ferment, determine what temperature ranges the yeast manufacturer recommends, and pick a well-insulated spot that doesn't experience any big swings in temperatures.

social homebrews

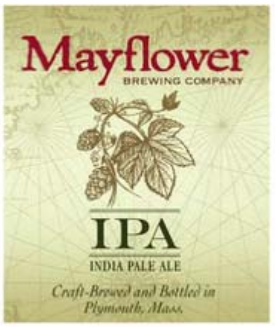
Like *BYO* on Facebook:
www.facebook.com/BrewYourOwn

Follow *BYO* on Twitter at: @BrewYourOwn

Joseph Mongan of Rockford, Illinois shared a photo of his "F Bomb" tap handle on Brew Your Own's Facebook page back in March.

"Just made my new F Bomb tapper handle for my F Bomb IPA from Staddy Brewing."

by marc martin



DEAR REPLICATOR, I'M NOT A HOP HEAD AND USUALLY DON'T GO FOR IPAS BUT RECENTLY I HAD THE OPPORTUNITY TO TOUR THE MAYFLOWER BREWERY IN PLYMOUTH, MASSACHUSETTS WHILE TRAVELING ON BUSINESS AND TASTED THEIR IPA. IT WAS THE BEST IPA I HAVE EVER TASTED. I RECENTLY BEGAN TO BREW MY OWN BEER AND WOULD LOVE TO BE ABLE TO MAKE THAT IPA.

VINCENT ANDREOZZI
VIA E-MAIL

"We could not take time for further search or consideration our victuals being much spent, especially our beer." So reads William Bradford's entry in the Mayflower ship's log of 1620. The weary pilgrims landed in Plymouth because they were out of beer. The pilgrims chose that location because of, "the very sweet brook" that provided pure water. Mayflower Brewing Founder Drew Brosseau, drawing from his lineage as a thirteenth generation descendent of John Alden — a cooper on that voyage — uses that same water for their great beers.

Growing up in Sonoma County, California, Drew's first exposure to craft brews came at the New Albion Brewery. He began homebrewing in 1982 and his love of homebrewing carried on through graduate school. To hone his brewing skills he completed the American Brewers Guild program in 2006 and established Mayflower in May of 2007.

Head Brewer Ryan Gwozdz began homebrewing in 2006. He started his brewing career on the bottling line at Buzzard's Bay Brewery in Westport, Massachusetts. He also attended the American Brewers Guild program in 2007 and has been with Drew at Mayflower from day one.

The IPA is one of their core beers and is designed to be closer to the English style. Ryan advises that it has evolved slightly from the specifications on their website with slightly higher bitterness and a lower alcohol level. Good fermentability is created by having a low mash temperature and the first two hop additions do a fine job of balancing the residual sweetness. Lots of late hops and dry hopping provides a wonderful aroma. It is truly a beer that the pilgrims would have wished for.

For more information about Mayflower Brewing Company visit the website www.mayflowerbrewing.com or call the brewery at 508-746-2674. BYO

MAYFLOWER BREWING COMPANY MAYFLOWER IPA CLONE

(5 gallons/19 L, extract with grains)

OG = 1.062 FG = 1.014 IBU = 72 SRM = 27 ABV = 6.2%

Ingredients

6.6 lbs. (3 kg) Coopers light, unhopped, malt extract
4 oz. (0.11 kg) light, dried malt extract
1.5 lb. (0.68 kg) two row pale malt
18 oz. (0.51 kg) Munich malt (8 °L)
10 oz. (0.28 kg) Weyerman CaraRed® malt (40 °L)
9.75 AAU Nugget hop pellets (0.75 oz./21 g of 13 % alpha acids) (60 min.)
12.8 AAU Simcoe® hop pellets (1 oz./28 g of 12.8 % alpha acids) (30 min.)
5 AAU Amarillo® hop pellets (0.5 oz./14 g of 10 % alpha acids) (5 min.)
5 AAU Amarillo® hop pellets (0.5 oz./14 g of 10 % alpha acids) (0 min.)
1.0 oz. (28 g) Glacier hop pellets (dry hop)
½ tsp. Irish moss (last 30 min.)
½ tsp. yeast nutrient (last 15 min.)
White Labs WLP 002 (English Ale) or Wyeast 1099 (Whitbread Ale) or Safale 04 (English Ale) yeast
0.75 cup (150 g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 2 gallons (7.6 L) of water at 150 °F (66 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.8L) of hot water. Add the liquid and dried malt extracts and boil for 60 minutes. Add the hops, Irish moss and yeast nutrient as per the schedule. Add the wort to 2 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing. Add the dry hops and allow the beer to condition for one week and then bottle or keg. Allow the beer to carbonate and age for two weeks.

All-grain option:

This is a single step infusion mash using an additional 10 lbs. (4.53 kg) two-row pale malt to replace the liquid and dry malt extracts. Mix all of the crushed grains with 5 gallons (19 L) of 171 °F (77.2 °C) water to stabilize at 150 °F (65.6 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (27.3 L) of wort runoff to boil for 60 minutes. Reduce the 60-minute Nugget hop addition to 0.6 oz. (17 g) (7.8 AAU) to allow for the higher utilization factor of a full wort boil. Follow the remainder of the extract with grains recipe.

Bursting with Flavor

Hop stands and hop bursting

by Glenn BurnSilver

A HOP STAND SOUNDS LIKE SOMETHING YOU'D DO WITH YOUR CAR AT A STOP SIGN, WHILE HOP BURSTING CONJURES UP IMAGES OF FLOWERS EXPLODING IN DEFENSE OF BEING HARVESTED. IN ACTUALITY, BOTH TERMS RELATE TO METHODS OF HOP UTILIZATION OCCURRING ONCE THE FLAME HAS BEEN TURNED OFF. TWO HOP EXPERTS SHARE THEIR THOUGHTS ON THE SUBJECT.

The hop stand is different than hop bursting, though they kind of relate in the same way. Hop stand is basically just letting your hops sit on the wort for a period of time. It can be 10 to 90 minutes depending on where it sits on the wort. It is not boiled.

Hop bursting is a technique where the brewer uses 95 percent or all of the hop additions in one single addition at the very end of the boil or during the whirlpool to pull as many flavor and aroma oils out of the hops while simultaneously not allowing the alpha acids to completely isomerize and vaporize the oils. We achieve almost all of our IBUs through this method, while maybe adding a small amount of hops at first wort or 60 min addition in our beers above 50 IBUs.

At temperatures of 175 °F (79 °C) and above you achieve a lot of isomerization of the hops alpha acids. Our theory is that we don't want to get a very bitter beer; we want a flavorful and aromatic beer. Adding the hops in the whirlpool will achieve 15 percent utilization on the bitterness side, but all the oils and compounds will remain in the wort on the way to the fermenter to achieve as much flavor and aroma as we possibly can.

At that stage (homebrewers) are pulling about 10 percent utilization. A lot is going to depend on the temperature. If it's at boil temperatures you're going to get a lot higher utilization, but as it cools that number starts to go down. When the temperature gets below 175 °F (79 °C) you're no longer isomerizing the alpha acids. That's really a temperature we try to get down to in the hop burst so we can start pulling those oils rather than boiling them off and turning them into bitterness compounds. Above 175 °F (79 °C) you're still getting a lot of aroma compounds as well. It depends how long they sit there.

We add our hops in the whirlpool as late as we can, about three-quarters of the way through. Since we want to get the hops off as fast as we can, we have a 20-minute rest in the whirlpool to get a good trub pile, then we start our knock out to the fermenter. We have a cold jacket that runs though our wort to cool it down and get it out of those high temperature ranges, allowing us to get more aroma and flavors into the beer. Don't let hops sit too long in the whirlpool.

There are formulas (to calculate utilization) out there, but they are not exact. It's better to throw in three times the amount (of hops). Trial and error is the best way. With normal utilization in the boil you get 30–35 percent utilization (for bitterness), but with hop bursting you get 10 percent utilization. So you'd need to add about three times the amount of hops in the whirlpool to achieve that bitterness level. But, all those flavors and aromas will pop through for a more flavorful and aromatic beer.

There are side effects to this practice. Your yield is going to go down because you're using more hops; less wort at the end. You might also pull some grassy compounds, depending on the hops you use. Noble-type varieties aren't necessarily best in hop bursting as you pull a lot more grassy notes and you could end with a really astringent beer. Aromatic varieties are mostly what we use: Amarillo®, Centennial and Chinook. Be sure to get a nice malt to go with it otherwise you get a really unbalanced beer.

This method is also expensive because you use three or four times more hops than a normal brew.

GOODLIFE BREWING · COMPANY BEND, OREGON

Curt Plants, Head Brewer at GoodLife Brewing Company in Bend, Oregon. GoodLife is Bend's newest brewery. And although they opened in mid 2011, they have already increased capacity by more than 60% with the addition of new 30-BBL and 120-BBL fermenters. GoodLife brews Descender IPA and The Rescue Pale using a "hopbursting" technique.

Mitch Steele, Head Brewer and Production Manager at Stone Brewing Co. in Escondido, California. Before coming to Stone, Mitch worked as the Assistant Brewmaster for Anheuser-Busch's Merrimack, New Hampshire facility. He is the author of *IPA: Brewing Techniques, Recipes and the Evolution of India Pale Ale* (Brewers Publications, 2012)

The way our hopping process works at Stone is that we do one hop addition at the start of the boil for bittering, then add all of our hops in the whirlpool and transfer the wort on top of the hops. This is the first brewery I've been at that's done things that way. It's a pretty good technique because you are getting a ton of hop aroma, but we're also getting more bitterness then we initially accounted for. We're seeing anywhere from 15 to 20 percent utilization with whirlpool hop additions. It surprised us — we thought it would be in the single digits, but it's pushing 20 percent.

The bottom line with this type of hopping is if the hops go in late they stay there until the wort is out of the vessel. They are going to be in contact with the hot wort for about an hour. We have a 15-minute rest and then it takes about 45 minutes to knock the wort out.

If you try this type of late hopping at home, you're going to get more flavor extraction the longer the hops sit in there, but there is a point when (the flavors) start going south on you, so don't leave them too long. Try experimenting with different lengths of time and hops.

The whole hop bursting technique is something we've been playing around with and I think it has a lot of potential. You're loading up on the back end of the hopping and not boiling for a long time, but you're still extracting the bitterness.

One way (homebrewers) can do this on a small scale is with a hopback. If you have one, you can just run the wort through a hopback and then you get exposure to the hops just for the time it takes to run the wort through. But you're going to get a different result then if you added hops to the whirlpool and just leave them in there like we do here at the brewery. BYO

More Mash Space

Adding body, minimizing hop sludge

by Ashton Lewis

Q I'M LOOKING AT INCREASING THE SIZE/BREWING CAPACITY OF MY HOMEBREWERY. RIGHT NOW I AM USING TWO 5-GALLON (19-L) BEVERAGE COOLERS AND THEY LIMIT ME TO AROUND 13 TO 14 POUNDS (5.8-6.4 KG) OF GRAIN IF I MASH AT A 1.25 QTS/LB. RATIO. WHEN I UPGRADE, I WANT TO BE ABLE TO DO BIGGER BEERS. HOW DO I DETERMINE THE GRAIN CAPACITY OF ANY GIVEN MASH TUN OF A CERTAIN VOLUME?

MARTY COATNEY
LEBANON, OREGON

A Sizing brewing vessels is part of my job with the Paul Mueller Company. When I am sizing mash mixers for brewing applications where the mash is conducted in a stirred and heated vessel and wort separation is conducted in a separate lauter tun I focus on two primary parameters. The first is the range of grist weights used in the mash and the second is the typical mash thickness (liters of water/kg malt), which is usually between 3.0–3.5 in stirred mashes. The mash thickness that you are using is equal to 2.6 when you convert everything to weight. All of the routine brewing calculations I perform are done using metric units. If I want to switch to English units I do this after my primary calculations because metric calculations are much clearer to me.

Mash volume can be calculated by the following:

Mash Volume (liters) =
(Mash thickness + 0.7) x kg malt

The 0.7 in the above equation accounts for the gain in volume that happens when 1 kg of malt is added to water and is empirically derived. Using an example based on your set up I will assume the mash thickness is 2.6 and the maximum grist weight is 14 pounds or 5.9 kg. The calculated mash volume is (2.6+0.7) x 5.9 or 19.5 liters (5.15 gallons). This agrees with your numbers.

Sizing a lauter tun is a different problem. The best way to think of a lauter tun or an infusion mash tun is like a filter. Filters are sized based on area and so are wort separation devices. The critical process parameter to consider is the grist load on the false bottom. This value varies from about 150 kg/m^2 on the low end up to about 300 kg/m^2 on the high end when brewing big beers with lauter tuns designed for normal strength (12 °Plato) lager beers. The grist load is used to determine the diameter of a mash tun or a lauter tun.

Let's look at an infusion mash tun that will be built with a false bottom design (as opposed to a copper pipe manifold), and target a grist load of 250 kg/m^2, a relatively normal load for this type of design (infusion mash tuns have higher grist loading than lauter tuns). I want to determine the diameter of this vessel and will begin by calculating the required area based on a maximum grist bill of 5.9 kg. To calculate area, simply divide 5.9 kg by 250 kg/m^2 and the result is 0.024 m^2 (0.25 ft^2). This corresponds to a circle with a diameter of less than 7 inches ($A=\pi r^2$). And this makes absolutely no sense in the eyes of the homebrewer. Why?

Commercial mash tuns and lauter tuns have grain beds that are considerably deeper than what is used at home. In the commercial world of really high-speed lauter tuns, grain beds are rarely any thinner than about 9 inches (23 cm), and most craft

> "The best way to think of a lauter tun or an infusion mash tun is like a filter. Filters are sized based on area and so are wort separation devices."

Photo by Les Jorgensen

brewers using lauter tuns have grain bed depths ranging from 12–24 inches (30–60 cm). Infusion mash tuns have deeper grain beds ranging from 24–36 inches (61–91 cm). So when it comes to designing the homebrew mash tun looking at the commercial world is not as helpful because the design would lead one to build a very odd looking vessel that is tall and skinny. Although the vessel would function, it would be something that could not be purchased off the shelf and would be expensive.

The good news is that designing the mash tun with a thinner grain bed is not a problem, as long as the bed is no thinner than about 6 inches (15 cm) deep. This corresponds to a grist load of about 80 kg/m^2 or a diameter of about 12 inches (30 cm). This is more what one would expect and is in-line with the typical 5-gallon (19 L), round water cooler like the one pictured on page 15.

This means that when you upgrade your system you have a few options. You can either scale up using a grist load of 80 kg/m^2, or you can scale up using a higher grist load. The advantage of scaling up using a higher grist load is that you may be able to find something readily available that meets your needs rather than staying with the lower grist load value. Whatever you decide, good luck with the project!

HOW DO I ADD BODY TO MY STOUT? MY STOUT HAS GOOD AROMA AND FLAVOR BUT IT SEEMS THIN. IS THERE A WAY TO ADD MORE BODY TO IT?

RICHARD HERNON
BOISE, IDAHO

The old thin-bodied stout is definitely one of the more frustrating flaws for this particular style. From what I have observed, this flaw is often associated with stouts that are brewed in an attempt to mimic the famed dry stouts of Ireland like Guinness, Murphy's and Beamish. These draught stouts all are dispensed using nitrogen and much of the body is directly related to the method of dispense. Take away the nitrogen dispense methods and the result is a thinner-bodied dark ale with the alcohol content of a light lager.

So, body-building tip #1 is to use mixed gas dispense methods when brewing dry, Irish-style stouts. Bottle conditioning this style or serving it with normal draft equipment is not going to result in the type of stout served at your favorite Irish pub.

The other frequent cause of thin-bodied stout, especially when styles other than dry, Irish-styled stout are considered, comes down to malt selection. It seems that many stout recipes contain pale malt, roasted grains (roasted malt, roasted barley, or a combination of the two totaling about 10% of the total), and perhaps a few other malts thrown in for good measure. Full-bodied beer, in general, begins with a grist bill composed of a variety of grains that have complexity of flavor.

Body-building tip #2 is to beef up your grist bill. If you are using very pale malt, or pale malt extract, as your base ingredient consider adding high-kilned malts like Munich, Vienna, amber and/or brown as a substitute for the pale malt. I also like adding crystal malts to my stouts to add some mid-palate fullness and a bit of sweetness in the finish. The type of crystal can be changed to bring different flavors into the fold based on your personal preferences. I like using darker crystals when I want the raisin and dark toffee notes associated with these sorts of malts. Lighter crystal malts bring a less obvious flavor to the mix. Another classic grain to add to stout is flaked barley or oats at a rate of 10% of the total grist. These grains are both rich in beta-glucans that add palate fullness. Oats are also known to add a silky, sometimes described as oily, mouthfeel to beer. And both grains slow down wort collection because they increase wort viscosity.

Sometimes beers lack body because the wort strength is simply too low to leave enough extract behind following fermentation to give body. Body-building tip #3 is to increase residual extract by adding more malt to increase the wort original gravity and/or by using higher mashing temperatures to reduce wort fermentability. You can enhance the perception of the increased residual extract by reducing your carbonation levels and serving your beer at temperatures that are warmer than the typical refrigerator. Hopefully there is a cure for your stouts in this answer.

ASIDE FROM MUSLIN BAGS, HOW CAN ONE AVOID SO MUCH HOP SLUDGE WHEN BREWING A HUGELY HOPPED BEER?

@6THFLOORBREWING (VIA TWITTER)
CHICAGO, ILLINOIS

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www.speidels-braumeister.de

A Copious volumes of hop sludge are a real problem for brewers who are in pursuit of hugely hopped beers because this sludge represents wort loss and batch size contraction. The net result is the inefficient use of ingredients and the reduction of your batch size. In commercial terminology, your material and labor costs are both increased and the opportunity costs associated with your equipment is reduced. Bad, bad, bad! Here are some ways that commercial brewers deal with this very real dilemma.

Solution #1: If you are using pelletized hops you are probably using a whirlpool to separate hops and trub from your wort. When brewing hop bombs you typically have a lot more hop solids to remove. A solution that is very effective is the implementation of a whirlpool vessel with a broader aspect ratio. "Normal" whirlpools have height to diameter ratios around 0.4:1 and very broad whirlpools have height to diameter ratios of about 0.25:1. There is a limit to the practicality of building really broad whirlpools because they become so large in diameter that they are not practical. They also cease to function when taken to the extreme.

Solution #2: Use whole hops instead of hop pellets and separate the hops from the wort with a hop strainer. Some brewers even add sparge water at this stage of wort production to minimize the wort loss associated with high hopping rates.

Solution #3: Use hop extracts for bittering instead of cone or whole hops. Since the name of the game is hop material reduction, this method is something to consider if you are coupling high bitterness with high aroma. Alpha acid extract can be added to the kettle, or if you want to venture out of the brewhouse you can add iso-alpha acid extract to your beer.

Solution #4: If you are using hop pellets and do not have a whirlpool, let alone a super broad whirlpool, consider collecting the sludge and transferring it to a conical vessel, such as an Imhoff cone (Google search this and you will find plenty of sources). You can allow the solids to settle and then syphon off the good stuff. If I did this I may consider re-boiling for a short period to make sure that I have not contaminated the wort.

Solution #5: This solution is totally impractical for use at home, but is something used by commercial brewers and is interesting to think about. The solution is to use a decanting centrifuge to separate hop and trub solids from wort and to reduce losses normally encountered in the whirlpool to almost nothing. In my beer geek brain, this is an awesome solution to a very real, and potentially very expensive, problem. BYO

Belgian Blond

Refreshing with restraint

by Jamil Zainasheff

I was recently in Belgium and, as always, beer was a significant part of the experience. One of the wonderful things about traveling in Belgium is experiencing the wide array of beers, fresh and in great condition. I remember how on my first trip to Belgium I was blown away by the difference between the beers I got at my local bottle shop and those served fresh in a café in Brussels. Everything was more flavorful, rich and crisp. Of course, the incredibly beautiful setting and being on vacation never hurts either. However, this trip it was a little different. Perhaps it is the passing of years and some deterioration of my sense of wonder, but this time I had no interest in drinking a Belgian blond. This is funny, because I would certainly enjoy one right now back here in the United States, but while I was in Belgium, blond ale seemed just too pedestrian. Why drink the more subtle and restrained when I could have the bold and funky?

That should not dissuade you from drinking or brewing Belgian blond. In fact, it is a great style, combining richness of flavors, aromas and alcohol, but with restraint, which is lacking in many other Belgian styles. Belgian blond ranges from 6.0 to 7.5% ABV with subtle, restrained spicy, fruity and alcohol flavors supported by a grainy, slightly sweet Pilsner malt character. While there might be a little upfront sweetness, good examples always finish dry and balanced. High carbonation and a medium body can contribute to a slightly creamy overall mouthfeel. While yeast character plays a highly significant role in most Belgian-style beers, in blond the yeast character should be a bit subtler. It is still complex and interesting, but Pilsner malt character is every bit as important. The gentle mix of fruity esters (lemon, orange, grapefruit, pear), sometimes light phenolic spiciness (pepper, clove) and smooth, slightly warming alcohols builds a complex but easy-drinking beer. These characteristic flavors and aromas come from malt and fermentation, not from the addition of fruits and spices.

The base malt for this style is continental Pilsner malt. Pilsner malt lends a slightly sweet, grainy malt character to the beer. If you can source it, Belgian Pilsner malt is ideal. If you cannot, do not worry, even Belgian brewers use other continental Pilsner malts. If you are an extract brewer, try to use an extract made from Pilsner malt. While it may seem like it is not worth the trouble, a beer like this does not have a lot of specialty malts to hide behind, so it is important to use a good quality Pilsner malt extract. Pilsner malt and some table sugar is really all you need, although some brewers will add other grains to help differentiate or enhance their beer. Oats, wheat, CaraPils®, aromatic, Vienna, Munich and other malts show up in various recipes.

Avoid caramel malts, especially those of higher color. Caramel flavor is not an appropriate character in blond. If you are going to experiment, focus on the grainy/bready malt flavors instead (such as biscuit, aromatic, Vienna, or Munich). You can experiment with other character grains, but remember this beer is more about the clean Pilsner malt character and fermentation flavors so do not overwhelm them with specialty malts. A little goes a long way — and even then it can be too much.

Belgian blond has a medium body and a dry finish. All-grain brewers should target a mash temperature around 150 °F (66 °C), which strikes a nice balance between fermentable and non-fermentable sugars. Simple sugar (table sugar) is a common ingredient in this style. Around 10% is a good starting point. Fermenting simple sugar does produce a different character than more complex sugars, and that is part of the style. For extract brewers, most extracts are

Continued on page 21

BELGIAN BLOND
by the numbers

OG:	1.062–1.075 (15.2–18.2 °P)
FG:	1.008–1.018 (2.0–4.6 °P)
SRM:	4–7
IBU:	15–30
ABV:	6.0–7.5%

Photo courtesy of Cephas

Belgian Blond
(5 gallons/19 L, all-grain)

OG = 1.065 (15.8 °P)
FG = 1.012 (3.0 °P)
IBU = 25 SRM = 5 ABV: = 7.0%

Ingredients

9.9 lb. (4.5 kg) Best Malz Pilsen (or similar continental Pilsner) malt (2 °L)
1.2 lbs. (560 g) cane or beet Sugar (0 °L)
7 oz. (200 g) Franco-Belges aromatic malt (20 °L)
7 oz. (200 g) Great Western wheat malt (2 °L)
5.6 AAU Hallertau pellet hops (1.4 oz./39 g at 4% alpha acids) (60 min.)
White Labs WLP500 (Trappist Ale) or Wyeast 1214 (Belgian Ale) yeast

Step by Step

Belgian Pilsner malt is the natural choice for the base malt. Feel free to substitute any high quality malt of a similar flavor and color from a different supplier. The sugar I use is the cheapest table sugar I can find at my warehouse store.

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 150 °F (66 °C). Hold the mash at 150 °F (66 °C) until enzymatic conversion is complete. Infuse the mash with near-boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.4 L) and the gravity is 1.050 (12.4 °P).

The total wort boil time is 90 minutes, which helps reduce the S-Methyl methionine (SMM) present in the lightly kilned Pilsner malt and results in less Dimethyl Sulfide (DMS) in the finished beer. Add the bittering hops with 60 minutes remaining in the boil. Add the sugar with 15 minutes left in the boil. Chill the wort rapidly to 64 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

You will need 2 packages of liquid yeast or you can make a 2.5L starter from 1 package. Pitch yeast at 64 °F (18 °C), aerate or oxygenate, and let the temperature rise slowly to 68 °F (20 °C) over the course of several days. Ferment until the yeast drops clear. With healthy yeast, fermentation should be complete in a week, but do not rush it. It is important for the beer to attenuate fully. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. When finished, carbonate the beer to approximately 3 volumes.

Belgian Blond
(5 gallons/19 L, extract with grains)

OG = 1.065 (15.8 °P)
FG = 1.012 (3.0 °P)
IBU = 25 SRM = 5 ABV = 7.0%

Ingredients

6.6 lb. (3 kg) Pilsner liquid malt extract (LME) (2 °L)
1 lb. (0.45 kg) light dried malt extract
1.1 lb. (500 g) cane or beet sugar (0 °L)
7 oz. (200 g) Franco-Belges aromatic malt (20 °L)
5.6 AAU Hallertau pellet hops (1.4 oz./39 g at 4% alpha acids) (60 min.)
White Labs WLP500 (Trappist Ale) or Wyeast 1214 (Belgian Ale) yeast

Step by Step

Try to find a Pilsner-type liquid malt extract made from 100% Pilsner malt, but feel free to substitute any high quality malt extract of a similar flavor and color. If you cannot get fresh liquid malt extract, it is better to use an appropriate amount of dry malt extract (DME) instead, since it does not oxidize nearly as fast and tends to be fresher. The sugar I use is the cheapest table sugar I can find at my warehouse store.

Because it can be tricky to get aromatic malt to convert by itself, you can consider the aromatic malt optional. You can omit it completely or replace it with a few ounces of Munich malt extract. If you do use the aromatic malt, it is best to try and get it to convert in a very simple mini mash. Mill or coarsely crack the aromatic malt and add it to 16 oz (0.5 L) of 158 °F (70 °C) water. Mix the grains until completely moist, and then do your best to keep the temperature between 150 and 160 °F (66 and 71 °C) for 30 minutes to one hour. You can do this by setting the container in a larger pot of hot water or wrapping it in a heating pad set on high. The warmer the temperature, the less time it will take to convert the starches, but don't let it go higher than 160 °F (71 °C) to avoid accidentally denaturing the enzymes in the malt. When done the liquid will taste slightly sweet. If it doesn't taste sweet, it didn't convert. Strain out the grains and rinse with warm water. Add the liquid from the mini mash along with enough water and malt extract to make a pre-boil volume of 5.9 gallons (22.3 L) and a gravity of 1.055 (13.6 °P). Stir thoroughly to help dissolve the extract and bring to a boil. Once the wort is boiling, add the bittering hops. The total wort boil time is 1 hour after adding the bittering hops. Add the sugar with 15 minutes left in the boil. Chill the wort rapidly to 64 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

You will need 2 packages of liquid yeast or you can make a 2.5L starter from 1 package. Pitch yeast at 64 °F (18 °C), aerate or oxygenate, and let the temperature rise slowly to 68 °F (20 °C) over the course of several days. Ferment until the yeast drops clear. With healthy yeast, fermentation should be complete in a week, but do not rush it. It is important for the beer to attenuate fully. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. When finished, carbonate the beer to approximately 3 volumes.

Belgian Blond Commercial Examples

Affligem Blond
Brouwerij Affligem
Opwijk, Belgium
www.affligembeer.be

Allagash Blonde
Allagash Brewing Company
Portland, Maine
www.allagash.com

Brugse Zot
Huisbrouwerij De Halve Maan
Bruges, Belgium
www.halvemaan.be

Free Style Belgian Blonde
Black Diamond Brewing Company
Concord, California
www.bdbrewing.com

La Trappe Blond
Brouwerij de Koningshoeven
Berkel-Enschot, Netherlands
www.latrappetrappist.com

Leffe Blond
AB InBev
Dinant, Belgium
www.leffe.com

Matilda
Goose Island Beer Company
Chicago, Illinois
www.gooseisland.com

Pater Lieven Blond
Brouwerij Van den Bossche
Sint-Lievens-Esse, Belgium
www.brouwerijvandenbossche.be

Stensbogaard Bryghus
Stensbogaard Bryghus
Ringe, Denmark
www.stensbogaardbryghus.dk

Troubadour Blond
Brouwerij The Musketeers
Ursel, Belgium
www.troubadourbieren.be

Val-Dieu Blonde
Brasserie de l'Abbaye du Val-Dieu
Aubel, Belgium
www.val-dieu.com

not quite fermentable enough on their own, but by adjusting the amount of simple sugar used to create your starting gravity, you can get enough attenuation to make a fine example.

Hop character is restrained, with a low spicy, earthy or floral hop aroma and flavor. I prefer to stick with noble hops such as Saaz, Hallertau or Tettnang. Traditionally, breweries also use Styrian Goldings or Kent Goldings and I think in a pinch other varieties such as Mount Hood or Liberty are fine as well. You certainly do not need any late hop additions, but if you do, a single, small addition near the end of the boil is about all you can add and still consider the beer a "traditional" example. Plenty of commercial and homebrewers are experimenting with increased aroma and flavor additions with this style, but do not

count on any of those types of experiments to do well in a homebrew competition if you plan on entering them as classic examples.

A good blond finishes dry, with not more than a medium bitterness. That dryness and bittering comes from alcohols, phenols, carbonation and hops. You can use any of the previously mentioned hops for bittering, striving to just balance the residual malt sweetness. The trick here is to keep in mind the contribution of alcohols and higher than average carbonation to the overall impression of bitterness. The bitterness-to-starting gravity ratio (IBU divided by OG) ranges between 0.25 and 0.5, although for most recipes a reasonable starting point is around 0.3 to 0.4.

There are many great yeast strains for brewing this style, but two of my favorites are White Labs WLP500 (Trappist Ale) and Wyeast 1214 (Belgian Ale). Other excellent choices are White Labs WLP530 (Abbey Ale), WLP540 (Abbey IV Ale Yeast), WLP550 (Belgian Ale Yeast) and Wyeast 1762 (Abbey II) or Wyeast 3787 (Trappist High Gravity). You cannot go wrong with any of these yeast strains. When selecting a yeast, keep in mind that the yeast always provides a great deal of the character of the finished beer. Any spicy, peppery notes you can taste in the finished beer are from yeast-produced phenols and the fruity notes are from yeast-produced esters. Whatever yeast you use, remember that your fermentation conditions affect what flavors and aromas the yeast produce. Pitching rate, oxygen level, nutrients, and temperature are like dials on your control panel of fermentation flavor. Getting the right settings is your job as a brewer.

> "A good blond finishes dry, with not more than a medium bitterness. That dryness and bittering comes from alcohols, phenols, carbonation and hops."

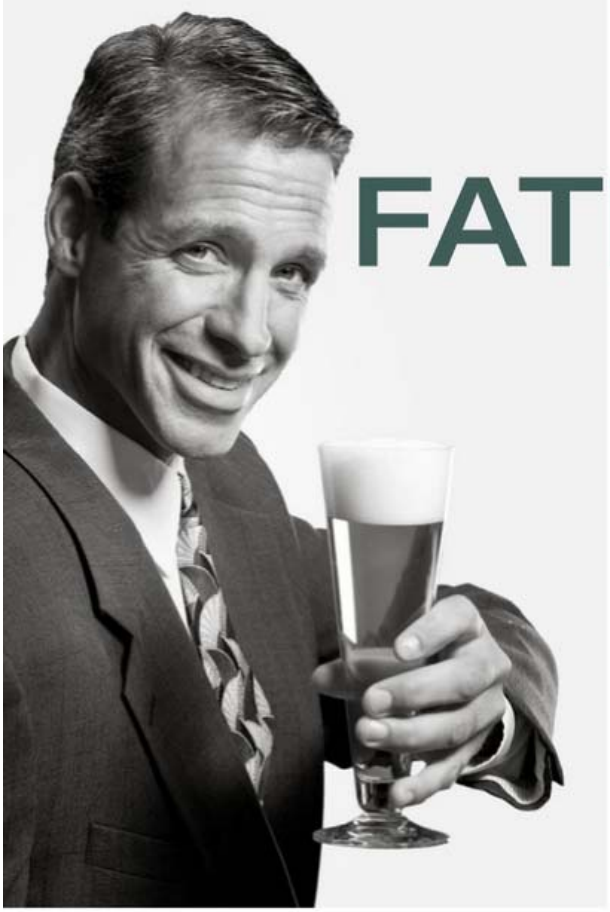
With most of these yeasts I recommend pitching at a rate of 0.75 million cells per milliliter per degree Plato (see the pitching rate calculator at www.mrmalty.com for help in calculating this for your beer). Pitch the yeast at a cool temperature and allow about 24 hours for yeast growth and then ramp up the temperature for the rest of fermentation to ensure good attenuation. For example, pitch the

yeast at 64 °F (18 °C) and raise the temperature to 70 °F (21 °C) over the course of a couple days. You may find that a higher or lower temperature gives you the ideal result, so do not be afraid to tweak the temperatures and pitching rate until you get it right. Do not let "how the big brewery does it" determine your process unless you are using the same equipment and methods.

One concern when brewing most Belgian-style beers is getting enough attenuation. Many brewers go with lower and lower mash temperatures in an attempt to achieve this, but that is not necessarily the problem. You do not need to get rid of all the long chain dextrins to make a dry beer. Those long chain dextrins are not very sweet and they can be present in a nice, dry beer. The most important thing is to make sure you ferment out all the simpler sugars completely. If you leave a lot of maltose behind unfermented, then the beer is going to taste sweet, even though it might attenuate well. Starting with a healthy pitch of yeast, aerating or oxygenating, and controlling temperatures are the key to getting a dry finish.

If you are having trouble getting a dry beer, one trick that seems to help is waiting until the fermentation is nearly done before adding the simple sugars. Wait until fermentation has started to slow down and then add the sugar. Adding the sugar after the yeast has consumed the maltose is like telling your kids to finish their dinner before they can have dessert. If you do not do that, sometimes the yeast will fill up on dessert first and have little desire to eat their dinner afterwards.

Oxygen is important to yeast health and is necessary for fermentation to reach terminal gravity in a reasonable amount of time. However, too much or too little oxygen can have unintended consequences, so adding the right amount of oxygen is important. That is difficult for many homebrewers, but at least you should try to control the amount of oxygen you are adding by timing and flow rate. The amount of oxygen needed is a balancing act along with the amount of yeast pitched. Initially adding oxygen reduces the amount of esters yeast produce, but high levels of oxygen also increase the amount of fusel alcohols, which are also a substrate for ester production. Keep in mind the need for a restrained Belgian fermentation character in this style. Playing around with the amount of oxygen and the pitching rate can make a huge difference. If you are using air, there is no chance of over-aerating your wort, but there is a chance of under-aerating. If you are using oxygen with a sintered stone, a good starting point for 5 US gallons (19 L) is a flow of 1 L per minute for 1 minute. You might go up or down from there, as experience shows you what is right for your beer. BYO



FATHER'S DAY GIFT GUIDE

Sunday, June 16th is Father's Day. Let's face it, your dad already has a closet full of ties, a glovebox overflowing with roadmap atlases and a cupboard full of #1 Dad mugs from Father's Days past. Doesn't he deserve to get some gifts this year that he'll really enjoy?

This Father's Day give him something he'll really use. Imagine his surprise when you show up with some of the fine beer and brewing related items on the next several pages to make him feel extra special. How about also bringing a six-pack, or better yet – a fresh Corney keg, of homebrew to let him know how much he means to you. If you're the homebrewing dad of the family, leave your copy of *BYO* on your wife's desk open to these pages or put them up on the refrigerator. Don't be shy – it's your day. Make sure your family knows what you'd really like to get this year that'll say, "Thanks, Dad," more than anything they might think you want.

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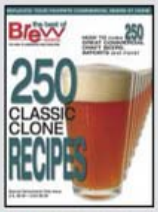

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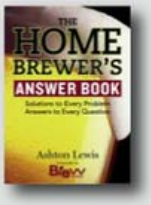

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By **Gordon Strong**

SAISON
A BEER FOR ALL SEASONS

Most beer geeks know that saison is a refreshing beer style associated with Wallonia, the French-speaking agricultural region of southern Belgium, and that the word literally means "season" in French. However, I'd bet that many of those same people don't understand what "season" means in this context. It doesn't mean different beers for each season, as one might suspect. It refers to a kind of beer that was brewed "in season" (i.e., during the cold winter and early spring, December through March, an idle time at most farms) and then kept as a provision (stock) ale for consumption during the active farming season (May through September).

Saison is often called a farmhouse ale, clearly identifying its roots as a locally-brewed beer for field workers, and evoking images of a rustic beer produced by small artisan farmer-brewers. That image is likely to be overly romanticized; the beer was brewed very locally at a farm, village or local collective, and designed to quench and refresh field workers. It had a rustic character due to primitive malting and the use of adjuncts and local farm-produced ingredients. As with most styles, it has evolved and expanded over time. Production of saison grew and consolidated as the need for local beer production was reduced with mechanization on the farm, and had mostly transitioned to larger breweries after World War II.

The style was originally a lower-alcohol product so as to not debilitate field workers, but tavern-strength products also existed. Higher strength and different-colored products began appearing after World War II, when the style was expanding into new markets. Dupont's Moinette, a "super saison" of 8.5% strength, was first produced in 1954 and is its flagship product in Belgium. A brown version (Moinette Brune) was first produced in the mid-1980s. Brasserie Fantôme began production in 1988, and has products evocative of the four seasons: Hiver (winter), Printemps (spring), Été (summer) and Automne (fall).

The best known modern saison is Saison Dupont Vieille Provision (old stock), a 6.5% ABV saison d'été (summer saison) first brewed at Brasserie Dupont in Tourpes in the 1920s. Simply known to most people as Saison Dupont, this beer is widely available in the US and serves as the prototype for the current Beer Judge


BELGIUM
SAISON DE PIPAIX
MARQUE DÉPOSÉE
BRASSERIE
A VAPEUR

Photo by Gordon Strong

The exterior of the Brasserie Dupont in Tourpes, Belgium, brewers of Saison Dupont Vieille Provision. The site of the current brewery (originally a working farm) dates back to 1759.

Photo by Gordon Strong

The author pours some samples of Brasserie Dupont's Moinette, a "super saison" which weighs in at 8.5 ABV and Moinette Brune, a brown version, while visiting the brewery.

Certification Program (BJCP) Style Guidelines definition of the style. Dupont produces saisons in a wide range of strengths. A lower-strength version, known as Biolégère (organic), weighs in at 3.5% ABV and is perhaps the closest modern version of the historic farm beverages. Not to be outdone, Dupont also brews a higher-strength limited edition 9.5% holiday version known as Avec les Bons Voeux de la Brasserie (with the best wishes of the brewery) — a personal favorite of mine.

As with most Belgian styles, saisons are not typically spiced, with brewers preferring to let the yeast, hops, and grains provide the character. But there are several well-known examples that do feature spicing or unusual ingredients. Brasserie à Vapeur Saison de Pipaix is probably the best known spiced version, featuring black pepper as a dominant flavor among other qualities. Brasserie de Blaugies Saison d'Epeautre uses spelt as a grain, but wheat, oats, rye and other cereal grains are also common ingredients in saison recipes.

This is a style that has not escaped the attention of American craft brewers, especially those that produce other Belgian-influenced beers.

Southampton, Lost Abbey, The Bruery, Jolly Pumpkin and Ommegang are fairly well-known producers, but many others may be giving the style a try. Expect American producers to be more experimental, so stash your style expectations for a while and see how the products taste. (Read more about American saisons in the July-August 2011 issue of *Brew Your Own*.) American producers might produce examples with more or different ingredients, often using *Brettanomyces* in the production, and can push the envelope with different colors, strengths and ingredients. Remember, regardless of the brewer's interpretation, the resulting product should be refreshing, interesting and drinkable. Excessive spice additions, overly sweet versions or massively funky interpretations showing more brashness than finesse are likely to be momentarily interesting but not worth revisiting.

Attributes of Modern Saison

Given that modern interpretations of saison can vary in strength from 3.5% to 9.5% ABV, and in color from pale yellow to black, it is hard to write a single style description that encompasses the entire range. It's best to think of saisons as a family of styles, with the normal saison being in the 5.5% to 6.5% range, table versions of less than 5%, and super saisons of 8% and greater. The stronger versions are more likely to have color variations, while the table and normal strength versions are typically pale. Pale versions are likely to have more bitterness and a greater hop character, while darker versions tend to have

more malt character and sweetness, yielding a more balanced presentation. Stronger versions often will have more malt flavor, richness and body simply due to their higher gravity. Although they tend to be well-attenuated, they may not be perceived to be as dry as normal-strength saisons due to their strength.

The normal saison can best be defined as a refreshing, highly-attenuated, moderately-bitter (20–35 IBUs), moderate strength (5.5–6.5%) Belgian ale with a dry finish. Most are highly carbonated (and bottle conditioned) as well as unfiltered. They often make use of non-barley cereal grains, may optionally use spices (always with moderation), and feature an expressive yeast character that is fruity, spicy and not overly phenolic. Sourness is totally optional, and may substitute somewhat for bitterness. Spices tend to be more peppery than clove-like, while the fruity esters can take on an apple, pear, apricot or citrus character. The hop bitterness can be restrained, although it can seem accentuated due to the high attenuation levels. The bitterness can have a harsh or coarse character due to water that is higher in carbonates and sulfates. The color tends towards gold to amber-orange. Overall, most will have a wild or rustic character that makes one think of *terroir* (a word used by winemakers to describe the geography, climate, growing conditions and even culture of a region that produces the special character of a product).

The other saisons in the family tend to have similar characteristics and balance, in particular the refreshing, highly-attenuated, dry character with high carbonation. The balance can change somewhat with strength and color variations, as I mentioned earlier, but the family resemblance of a farmhouse ale should be evident. The Saison yeast character is a must, although maltier and richer versions will tend to mask this character more.

Homebrewing Saisons

While researching homebrewed saison recipes, I turned to a few guys whose beers I had tasted, who had won recent awards, or who I knew to be excellent brewers: Steve Fletty of St. Paul, Minnesota, Brian Jackson of Cincinnati, Ohio and Nathan Smith of San Leandro, California.

Steve Fletty won Best of Show at the 2012 Minnesota State Fair (620 entries) with a winter-style Dark Saison. I've enjoyed Steve's saisons for years, and he's my go-to guy for saison questions. I remember several years ago doing a side-by-side tasting of the same saison recipe with different cereal grain adjuncts, as well as different yeasts. He prefers the Wyeast 3726 (Farmhouse Ale) yeast (Blaugies strain), but also likes the Wyeast 3711 (French Saison) yeast. He says the Dupont yeast can be finicky and unpredictable, even if fermented very hot, and often won't completely attenuate. He has also tried different seasonal strains, but keeps coming back to the Blaugies yeast. He has recently been experimenting with different fermentation temperatures to see if the hot (85 °F/29 °C) recommendations are required for yeast other than the Dupont strain. So far, he observes that the 3726 and 3711 yeast seem to perform as well at normal (68 °F/20 °C) temperatures as at the elevated temperatures. Time to call *MythBusters*?

Steve is quite opinionated about Saisons (having made more than 20 of them), and wanted to stress that "farmhouse" does not mean "barnyard" — *Brettanomyces* isn't required. "A Saison shouldn't taste like Orval," he said. *Brett* can add interest and help dry out the beer, but it shouldn't be a dominant character; he recommends *B. lambicus* if it must be used. He has tried wheat, spelt, naked oats and rye as specialty grains but prefers rye and wheat the best. Various sugars and honeys can be used to lighten the body and increase attenuation, but he doesn't like to use spices, preferring to let the yeast do the talking. He cites Phil Markowski's book *Farmhouse Ales* as his primary inspiration, but has tasted every commercial saison he can find to help with his recipe targets.

As for fall and winter saisons, Steve recommends getting more body, avoiding roasty flavors and toning

Continued on page 40

Rye Saison
by Steve Fletty,
St. Paul, Minnesota
(5 gallons/19 L, all-grain)
OG = 1.056 FG = 1.008
IBU = 31 SRM = 5 ABV = 6.3%

Ingredients
9 lb. 11 oz. (4.4 kg) US 6-row malt
1 lb. 11 oz (765 g) flaked rye
9 oz. (0.26 kg) Turbinado sugar
7.3 AAU Nugget hops
(0.56 oz./16 g of 13% alpha acids)
(60 min.)
2.2 AAU Amarillo® hops
(0.25 oz./7 g of 8.9% alpha acids)
(15 min.)
2.4 AAU Centennial hops
(0.25 oz./7 g of 9.5% alpha acids)
(15 min.)
0.5 oz. (14 g) Amarillo® hops (0 min.)
0.5 oz. (14 g) Centennial hops (0 min.)
Wyeast 3726 (Farmhouse Ale) yeast
(1-qt./1-L yeast starter)
1 cup corn sugar (for priming)

Step by Step
Two or three days before brew day, make the yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast.

On brew day, mash in the malt and rye at 149 °F (65 °C) in 15 qts. (14 L) of water. Hold at this temperature for 60 minutes. Raise the mash temperature to 170 °F (77 °C), hold for 5 minutes then recirculate. Run off the wort and sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Collect 6.5 gallons (25 L) of wort. (Check that final runnings do not drop below SG 1.010.) Boil the wort for 90 minutes, adding hops at times indicated in the ingredients list. Add the sugar at the end of the boil, stirring to dissolve.

Chill the wort, transfer it to a fermenter and pitch the yeast. Ferment at 85 °F (29 °C). Bottle condition.

Variation: Substitute flaked wheat for rye; substitute Styrian Goldings for Amarillo® and Centennial.

Rye Saison
by Steve Fletty,
St. Paul, Minnesota
(5 gallons/19 L, partial mash)
OG = 1.056 FG = 1.008
IBU = 31 SRM = 5 ABV = 6.5%

Ingredients
2 lb. 3 oz. (1 kg) US 6-row malt
1 lb 11 oz. (0.77 kg) flaked rye
1.25 lbs. (0.57 kg) light dried malt extract
3.3 lbs. (1.5 kg) light liquid malt extract
9 oz. (0.26 kg) Turbinado sugar
7.3 AAU Nugget hops
(0.56 oz./16 g of 13% alpha acids)
(60 min.)
2.2 AAU Amarillo® hops
(0.25 oz./7 g of 8.9% alpha acids)
(15 min.)
2.4 AAU Centennial hops
(0.25 oz./7 g of 9.5% alpha acids)
(15 min.)
0.5 oz. (14 g) Amarillo® hops (0 min.)
0.5 oz. (14 g) Centennial hops (0 min.)
Wyeast 3726 (Farmhouse Ale) yeast
(1-qt./1-L yeast starter)
1 cup corn sugar (for priming)

Step by Step
Mash the grains at 149 °F (65 °C) in 6 qts. (5.6 L) of water. Hold at this temperature for 60 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3 gallons (11 L) of wort. Stir in the dried malt extract and boil the wort for 90 minutes, adding hops at times indicated. Add liquid malt extract and sugar in the final 15 minutes of the boil. Chill the wort, transfer it to a fermenter and top up to 5 gallons (19 L). Aerate the wort and pitch yeast. Ferment at 85 °F (29 °C). Bottle condition.

Rye Saison
by Steve Fletty,
St. Paul, Minnesota
(5 gallons/19 L, extract)
OG = 1.057 FG = 1.008
IBU = 40 SRM = 5 ABV = 6.5%

Ingredients
1 lb. (0.45 kg) liquid rye malt extract
2.25 lbs. (1 kg) light dried malt extract
3.3 lbs. (1.5 kg) light liquid malt extract
9 oz. (0.26 kg) Turbinado sugar
7.3 AAU Nugget hops
(0.56 oz./16 g of 13% alpha acids)
(60 min.)
2.2 AAU Amarillo® hops
(0.25 oz./7 g of 8.9% alpha acids)
(15 min.)
2.4 AAU Centennial hops
(0.25 oz./7 g of 9.5% alpha acids)
(15 min.)
0.5 oz. (14 g) Amarillo® hops (0 min.)
0.5 oz. (14 g) Centennial hops (0 min.)
Wyeast 3726 (Farmhouse Ale) yeast
(1-qt./1-L yeast starter)
1 cup corn sugar (for priming)

Step by Step
Add the dried malt extract and sugar to enough water to make at least 3 gallons (11 L) of wort. Boil wort for 90 minutes, adding hops at times indicated. Keep some boiling water handy and do not let the boil volume dip below 3 gallons (11 L). Add the liquid malt extract in the final 15 minutes of the boil. Chill the wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate the wort and pitch the yeast. Ferment at 85 °F (29 °C). Bottle condition.

Variation: You may use liquid wheat malt extract in place of rye.

Tips for Success:
To hit the standard CO_2 level for a typical Belgian beer (about 8 grams per liter), this recipe recommends one cup of sugar, which is a bit more than the typical ¾ cup suggested by most homebrew experts in many recipes. Traditional Belgian yeast requires higher temperatures to condition efficiently, and most Belgian breweries have "warm rooms" for bottle conditioning that hold the temperature constant throughout the conditioning period. You can do this at home by bottle conditioning in a spot that is consistently around 78 °F (25 °C), which is above room temperature. Read more at http://byo.com/story1207. For more about corking Belgian-style beers, visit http://byo.com/story1886

Dark Saison
by Steve Fletty,
St. Paul, Minnesota
(5 gallons/19 L, all-grain)
OG = 1.073 FG = 1.007
IBU = 33 SRM = 22 ABV = 8.6%

Ingredients
7 lbs. 12 oz. (3.5 kg) Belgian Pilsner malt
4 lbs. 8 oz. (2 kg) Belgian pale ale malt
2 lbs. (0.91 kg) D2 candi syrup
5.94 AAU Styrian Goldings hops (1.1 oz./31 g at 5.4% alpha acids) (70 min.)
5 AAU Saaz hops (1.25 oz./35 g at 4% alpha acids) (15 min.)
Wyeast 3726 (Farmhouse Ale) yeast (2 qt./2 L yeast starter)
¾ cup corn sugar (for priming)

Step by Step
Two or three days before brew day, make the yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast.

On brew day, mash in the malt and rye at 148 °F (64 °C) in 18 qts. (17 L) of water. Hold at this temperature for 75 minutes. Raise the mash temperature to 170 °F (77 °C), hold for 5 minutes then recirculate. Run off the wort and sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Collect 6.5 gallons (25 L) of wort. (Check that final runnings do not drop below SG 1.010.) Boil the wort for 90 minutes, adding hops at times indicated. Add syrup at end of boil, stirring to dissolve. Chill the wort and transfer to a fermenter. Aerate the wort and pitch yeast. Ferment at 72 °F (22 °C). Bottle condition.

Dark Saison
by Steve Fletty,
St. Paul, Minnesota
(5 gallons/19 L, partial mash)
OG = 1.073 FG = 1.007
IBU = 33 SRM = 22 ABV = 8.6%

Ingredients
3 lbs. 2 oz. (1.4 kg) Belgian Pilsner malt
10 oz. (0.28 kg) Belgian Pale Ale malt
3 lbs. (1.4 kg) liquid Pilsner malt extract
2 lbs. (0.91 kg) light dried malt extract
2 lbs. (0.91 kg) D2 candi syrup
5.94 AAU Styrian Goldings hops (1.1 oz./31 g at 5.4% alpha acids) (70 min.)
5 AAU Saaz hops (1.25 oz./35 g at 4% alpha acids) (15 min.)
Wyeast 3726 (Farmhouse Ale) yeast (2 qt./2 L yeast starter)
¾ cup corn sugar (for priming)

Step by Step
Mash the grains at 148 °F (65 °C) in 5.5 qts. (5.2 L) of water. Hold at this temperature for 60 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 90 minutes, adding hops at times indicated. Add liquid malt extracts and syrup in the final 15 minutes of the boil.

Chill the wort, transfer to a fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 72 °F (22 °C). Bottle condition.

Dark Saison
by Steve Fletty,
St. Paul, Minnesota
(5 gallons/19 L, extract)
OG = 1.073 FG = 1.007
IBU = 33 SRM = 20 ABV = 8.6%

Ingredients
5 lbs. (2.3 kg) liquid Pilsner malt extract
3 lbs. (1.4 kg) light liquid malt extract
2 lbs. (0.91 kg) D2 candi syrup
5.94 AAU Styrian Goldings hops (1.1 oz./31 g at 5.4% alpha acids) (70 min.)
5 AAU Saaz hops (1.25 oz./35 g at 4% alpha acids) (15 min.)
Wyeast 3726 (Farmhouse Ale) yeast (2 qt./2L yeast starter)
¾ cup corn sugar (for priming)

Step by Step
Add Pilsner malt extract and enough water to make at least 3 gallons (11 L) of wort. Boil wort for 90 minutes, adding hops at times indicated. Keep some boiling water handy and do not let boil volume dip below 3 gallons (11 L). Add light liquid malt extract and syrup in the final 15 minutes of the boil. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate the wort and pitch the yeast. Ferment at 72 °F (22 °C). Bottle condition.

Tips for Success:
Oxygen is critical for yeast growth, so be sure to aerate your wort well before you pitch the yeast. Greg Doss, a microbiologist and brewer with Wyeast, recommends that "brewers should use 8–15 ppm of oxygen for healthy fermentations," but with Belgian ales "12–15 ppm oxygen is recommended." Doss also says that "splashing and shaking the carboy, a traditional homebrew method, only reached 8 ppm of dissolved oxygen where 15 ppm can be reached with pure oxygen and a stone in 80 seconds." So to run better Belgian-style (and other higher-gravity) fermentations, consider investing in an oxygen stone aerating setup.

Also be sure to control the temperature of your fermentation. While Belgian styles are often fermented at warmer temperatures, allowing the fermentations to go higher than the recommended temperature range of your yeast strain can result in harsh fusel alcohols in the finished beer. However, if your pitch rate is high, then the fermentation temperature can be safely elevated up to the maximum temperature in the yeast's range. Chris White of White Labs says that one way to bring out the character in the yeast is one where, "breweries let the temperature free rise which lets the yeast ferment out quickly and creates the flavors that the brewers are looking for." You can do this at home by pitching your yeast at a cooler temperature and allowing the fermentation to rise as it creates its own heat until it comes into the recommended fermentation range listed in your recipe or by the yeast manufacturer. For more about Belgian-style fermentations and yeast strains, visit http://byo.com/story1664. For more information about controlling your fermentation temperatures at home, visit http://byo.com/story1869

Saison with Ginger

Recipe by Brian Jackson, Cincinnati, Ohio
(5 gallons/19 L, all-grain)
OG = 1.060 FG = 1.009
IBU = 15 SRM = 6 ABV = 6.7%

Ingredients

8 lbs. 7 oz (3.8 kg) German Pilsner malt
1 lb. 13 oz. (0.82 kg) German wheat malt
10 oz. (0.28 kg) German Vienna malt
1 lb. (0.45 kg) blonde candi syrup
1.2 AAU Saaz hops
(0.4 oz./11 g at 3% alpha acids)
(60 min.)
1.2 AAU Saaz hops
(0.4 oz./11 g at 3% alpha acids)
(60 min.)
0.75 oz. (21 g) fresh ginger
(grated – see note) (22 min.)
1 AAU Hallertauer hops
(0.25 oz./7 g at 3.9% alpha acids)
(17 min.)
0.75 AAU Saaz hops
(0.25 oz./7 g at 3% alpha acids)
(17 min.)
3.9 AAU Hallertauer hops
(1 oz./28 g at 3.9% alpha acids)
(3 min.)
1 AAU Styrian Goldings hops
(0.5 oz./14 g at 3.8% alpha acids)
(3 min.)
0.75 AAU Saaz hops
(0.25 oz./7 g at 3% alpha acids)
(3 min.)
Wyeast 3711 (French Saison) yeast
(1 qt./1 L yeast starter)
1 cup corn sugar (for priming)
Note: Grate ginger before brewing and let air dry. Start adding at 22 min, and add in small, even increments, until 7 minutes left in the boil.

Step by Step

Mash in the malt at 109 °F (43 °C) in 16.5 qts. (15.6 L) of water. Hold at this temperature for 20 minutes. Raise the mash temperature to 143 °F (62 °C), hold for 45 minutes. Raise the temperature to 153 °F (67 °C), hold for 15 minutes, then recirculate. Do not mash out. Run off wort and sparge with 168 °F (76 °C) water. Collect 6.5 gallons (25 L) of wort. (Be sure final runnings do not drop below SG 1.010.) Boil the wort for 90 minutes, adding the hops at times indicated. Add the candi syrup at end of the boil, stirring to dissolve. Chill wort, transfer to fermenter and ferment at 75 °F (24 °C), allowing to rise to 80 °F (27 °C). Bottle condition.

Saison with Ginger

Recipe by Brian Jackson, Cincinnati, Ohio
(5 gallons/19 L, partial mash)
OG = 1.061 FG = 1.009
IBU = 15 SRM = 6 ABV = 6.7%

Ingredients

12 oz. (0.34 kg) German Pilsner malt
1 lb. 13 oz. (0.82 kg) German wheat malt
10 oz. (0.28 kg) German Vienna malt
5 lbs. (2.3 kg) liquid Pilsner malt extract
1 lb. (0.45 kg) blonde candi syrup
1.2 AAU Saaz hops
(0.4 oz./11 g at 3% alpha acids)
(60 min.)
1.2 AAU Saaz hops
(0.4 oz./11 g at 3% alpha acids)
(60 min.)
0.75 oz. (21 g) fresh ginger (see note in all-grain recipe) (22 min.)
1 AAU Hallertauer hops
(0.25 oz./7 g at 3.9% alpha acids)
(17 min.)
0.75 AAU Saaz hops
(0.25 oz./7 g at 3% alpha acids)
(17 min.)
3.9 AAU Hallertauer hops
(1 oz./28 g at 3.9% alpha acids)
(3 min.)
1 AAU Styrian Goldings hops
(0.5 oz./14 g at 3.8% alpha acids)
(3 min.)
0.75 AAU Saaz hops
(0.25 oz./7 g at 3% alpha acids)
(3 min.)
Wyeast 3711 (French Saison) yeast
(1 qt./1 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Mash grains at 145 °F (63 °C) in 4.8 qts. (4.5 L) of water. Hold at this temperature for 45 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3 gallons (11 L) of wort. Stir in half the Pilsner extract and boil wort for 90 minutes, adding hops at times indicated. Add remaining liquid malt extract and syrup in the final 15 minutes of the boil. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Follow fermentation instructions for all-grain recipe.

Saison with Ginger

Recipe by Brian Jackson, Cincinnati, Ohio
(5 gallons/19 L, extract)
OG = 1.060 FG = 1.009
IBU = 18 SRM = 3.2 ABV = 6.8%

Ingredients

2 lbs. (0.91 kg) liquid wheat malt extract (65/35 wheat/pale)
5 lbs. (2.3 kg) liquid Pilsner malt extract
1 lb. (0.45 kg) blonde candi syrup
0.25 lb. (113 g) white sugar
1.2 AAU Saaz hops
(0.4 oz./11 g at 3% alpha acids)
(60 min.)
1.2 AAU Saaz hops
(0.4 oz./11 g at 3% alpha acids)
(60 min.)
0.75 oz. (21 g) fresh ginger (see note in all-grain recipe) (22 min.)
1 AAU Hallertauer hops
(0.25 oz./7 g at 3.9% alpha acids)
(17 min.)
0.75 AAU Saaz hops
(0.25 oz./7 g at 3% alpha acids)
(17 min.)
3.9 AAU Hallertauer hops
(1 oz./28 g at 3.9% alpha acids)
(3 min.)
1 AAU Styrian Goldings hops
(0.5 oz./14 g at 3.8% alpha acids)
(3 min.)
0.75 AAU Saaz hops
(0.25 oz./7 g at 3% alpha acids)
(3 min.)
Wyeast 3711 (French Saison) yeast
(1 qt./1 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Add 4 lbs. (1.8 kg) Pilsner malt extract and water to make at least 3 gallons (11 L) of wort. Boil wort for 90 minutes, adding hops as indicated. Keep some boiling water handy and do not let boil volume dip below 3 gallons (11 L). Add remaining malt extracts, sugar and syrup in the final 15 min of the boil. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast. Follow fermentation instructions for all-grain recipe.

"Best Wishes" Saison

Recipe by Nathan Smith, San Leandro, California
(5 gallons/19 L, all-grain)

OG = 1.062 (before sugar, 1.077 after)
FG = 1.004
IBU = 34 SRM = 4 ABV = 9.6%

Ingredients

12 lbs. 9 oz. (5.7 kg) Belgian Pilsner malt
1 lb. 12 oz. (0.79 kg) Turbinado sugar (see note)
6.3 AAU Hallertauer hops (1.25 oz./35 g at 5% alpha acids) (60 min.)
1.8 AAU Styrian Goldings hops (0.4 oz./11 g at 4.5% alpha acids) (30 min.)
2.7 AAU Styrian Goldings hops (0.6 oz./17 g at 4.5% alpha acids) (15 min.)
2 oz. (57 g) Saaz hops (0 min.)
Wyeast 3724 (Belgian Saison) yeast or White Labs WLP565 (Belgian Saison I) yeast (2 qt./2 L yeast starter)
1 cup corn sugar (for priming)

Note: All Turbinado sugar was added during the fermentation at 90 °F (32 °C). Make a simple syrup by adding the sugar to 1.4 qts (1.3 L) water, then simmering for 12 min. Cool to fermentation temperature, then add half at two days after pitching, and the other half at four days after pitching.

Step by Step

On brew day, use soft (distilled or RO) water, adding 3.5 g gypsum (roughly ¾ tsp) to the mash. Mash in the malt at 145 °F (63 °C) in 18.75 qts. (17.75 L) of water. Hold at this temperature for 90 minutes. Raise mash temperature to 165 °F (74 °C), hold for 15 minutes, then recirculate. Run off wort and sparge with 168 °F (76 °C) water. Collect 6.5 gallons (25 L) of wort. (Check that final runnings do not drop below SG 1.010.) Boil wort for 90 minutes, adding hops at times indicated. Add syrup per the note. Pitch yeast at 70 °F (21 °C), raising to 85 °F (29 °C) the next day, then to 90 °F (32 °C) three days after pitching. Hold at 90 °F (32 °C) for 14 days total. Bottle condition. Condition at 75 °F (24 °C) for 2 weeks, then cold condition for three weeks at 40 °F (4 °C). Additional cellaring improves character.

"Best Wishes" Saison

Recipe by Nathan Smith, San Leandro, California
(5 gallons/19 L, partial mash)

OG = 1.061 (before sugar, 1.077 after)
FG = 1.004
IBU = 34 SRM = 4 ABV = 9.6%

Ingredients

3 lbs. 5 oz. (1.5 kg) Belgian Pilsner malt
6 lbs. (2.7 kg) liquid Pilsner malt extract
1 lb. 12 oz. (0.79 kg) Turbinado sugar (see note in all-grain recipe)
6.3 AAU Hallertauer hops (1.25 oz./35 g at 5% alpha acids) (60 min.)
1.8 AAU Styrian Goldings hops (0.4 oz./11 g at 4.5% alpha acids) (30 min.)
2.7 AAU Styrian Goldings hops (0.6 oz./17 g at 4.5% alpha acids) (15 min.)
2 oz. (57 g) Saaz hops (0 min.)
Wyeast 3724 (Belgian Saison) yeast or White Labs WLP565 (Belgian Saison I) yeast (2 qt./2L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Mash grains at 145 °F (63 °C) in 5 qts. (4.7 L) of water. Hold at this temperature for 60 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3 gallons (11 L) of wort. Stir in 2 lbs (0.91 kg) of the liquid extract and boil wort for 90 minutes, adding hops at times indicated. Add remaining liquid malt extract in the final 15 minutes of the boil. Add syrup per the note. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast at 70 °F (21 °C), raising to 85 °F (29 °C) the next day, then to 90 °F (32 °C) three days after pitching. Hold at 90 °F (32 °C) for 14 days total. Bottle condition. Condition at 75 °F (24 °C) for two weeks, then cold condition for three weeks at 40 °F (4 °C). Additional cellaring improves character.

"Best Wishes" Saison

Recipe by Nathan Smith, San Leandro, California
(5 gallons/19 L, extract)

OG = 1.058 (before sugar, 1.077 after) FG = 1.004
IBU = 35 SRM = 3.2 ABV = 9.8%

Ingredients

8 lbs. (3.6 kg) liquid Pilsner malt extract
1 lb. 14 oz. (0.85 g) Turbinado sugar (see note in all-grain recipe)
6.3 AAU Hallertauer hops (1.25 oz./35 g at 5% alpha acids) (60 min.)
1.8 AAU Styrian Goldings hops (0.4 oz./11 g at 4.5% alpha acids) (30 min.)
2.7 AAU Styrian Goldings hops (0.6 oz./17 g at 4.5% alpha acids) (15 min.)
2 oz. (57 g) Saaz hops (0 min.)
Wyeast 3724 (Belgian Saison) yeast or White Labs WLP565 (Belgian Saison I) yeast (2 qt./2L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Add 4 lbs (1.8 kg) Pilsner malt extract and enough water to make at least 3 gallons (11 L) of wort. Boil wort for 90 minutes, adding hops at times indicated. Keep some boiling water handy and do not let boil volume dip below 3 gallons (11 L). Add remaining malt extract in the final 15 minutes of the boil. Add syrup per the note. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast at 70 °F (21 °C), raising to 85 °F (29 °C) the next day, then to 90 °F (32 °C) three days after pitching. Hold at 90 °F (32 °C) for 14 days total. Bottle condition. Condition at 75 °F (24 °C) for two weeks, then cold condition for three weeks at 40 °F (4 °C). Additional cellaring improves character.

Tips for Success:

Get your yeast starter going two or three days before you plan to brew to grow a robust population of healthy cells for brew day. Visit http://byo.com/yeaststarter for more information about making a yeast starter, as well as a table for recommended starter sizes for a variety of worts. For more about pitching rates, check out *BYO*'s online charts at http://www.byo.com/resources/pitching

Photo by Gordon Strong

Brassiere Dupont also brews some organic saisons, including Biolégère, which is 3.5% ABV and Bière de Miel (above), which weighs in at 8% ABV and is brewed with honey.

Many traditional and modern saisons are bottle conditioned and packaged in pressure-resistant 750-mL glass bottles, which are sealed with Champagne-style corks and caged in wire.

down the hops accordingly. While his recipe uses dark candy sugar for color and flavor, I would think that Munich, Vienna, CaraMunich®, CaraVienne® and similar grains would also add complexity and character, similar to what might be found in a Belgian dubbel. Many Belgian Christmas-type beers are spiced, so I would think orange peel, star anise, black pepper and similar warming spices might be interesting additions.

Steve recommends starting lower in gravity so that a low final gravity can be obtained. Even with a high attenuation, a lower final gravity is important

Saison Commercial Examples

Carnevale
The Lost Abbey
San Marcos, California
www.lostabbey.com

Fantôme Saison
Brasserie Fantôme
Soy, Belgium
www.fantome.be

Funkwerks Saison
Funkwerks
Fort Collins, Colorado
www.funkwerks.com

Hennepin
Brewery Ommegang
Cooperstown, New York
www.ommegang.com

Moinette
Brasserie Dupont
Tourpes, Belgium
www.brasserie-dupont.com

Red Barn Ale
The Lost Abbey
San Marcos, California
www.lostabbey.com

Saison Brett
Boulevard Brewing Company
Kansas City, Missouri
www.boulevard.com

Saison Dupont
Brasserie Dupont
Tourpes, Belgium
www.brasserie-dupont.com

Saison de Pipaix
La Brasserie a Vapeur
Pipaix, Belgium
www.vapeur.com

Saison Silly
Brasserie de Silly
Silly, Belgium
www.silly-beer.com

Saison Station 55
Hopfenstark
L'Assomption, Quebec
www.hopfenstark.com

to get that dry mouthfeel. He doesn't think saisons should be noticeably alcoholic ("If dried out properly, you don't need it"). He says the biggest faults he sees as a judge are beers that are flabby, overly spiced, boozy and filled with *Brett* flavors, when they should be clean, refreshing, dry and hoppy.

Brian Jackson won Best of Show at the 2012 Beer & Sweat competition (261 entries, keg-only) with The Awakening, a saison with ginger. His biggest recommendations for the style involves attenuation: step mashing with a low conversion temperature and no mash out to get maximum wort fermentability, aided by a sugar addition. He also selected the French Saison yeast to avoid issues with the finicky Dupont strain. He kept his malt and hops simple, looking for some character in the base beer to allow aromatics and flavor to be better featured. He cites Stan Hieronymus' *Brew Like a Monk* and also *Farmhouse Ales* as primary references.

Nathan Smith, a multiple National Homebrew Competition medalist and my primary resource for all things hoppy, caught my attention recently when he tweeted that he thought he had successfully cloned Dupont's Avec Les Bons Voeux. He did a split batch with Wyeast 3724 and White Labs WLP565 (both reputed to be the Dupont yeast) to try to pick a favorite. Last time I spoke with him, he seemed to believe that blending the two might be the most interesting outcome, but I'd suspect that the beers will keep changing as they age. He provided some detailed tasting notes on the yeast differences:

"Wyeast 3724: More earthy, minty, slightly malty and ethanol-driven. Esters are like super ripe sweet pears. Esters are more one-dimensional, everything else multi-dimensional. Big, complex, evolving, with some classic Dupont complexity."

"WLP565: More mixed fruit (ripe plum, bosc pear) and hop-driven. Seems much drier even though has similar stats. Multi-dimensional esters, more simplistic malt, hops and ethanol. Big and direct, like a cross between Dupont and Westmalle yeast."

Those are very interesting tasting notes; I'd love to see them again when the beer is a year old. Nathan recommends using fermwraps to maintain the high fermentation temperature. He also used third-generation re-pitches of his yeast from successively higher ABV saisons (3.5% and 6.2%). He recommends not even trying to taste the beer until after it has finished cold conditioning. Patience, grasshopper . . .

provision beers aren't meant to be consumed immediately.

These guys have shared four recipes with me, representing many different variations of the style, using different techniques and ingredients. Feel free to play with the recipes (starting on page 36) and vary the ingredients based on what I've discussed in this article — saison is a style that invites experimentation. BYO

Photos by ©Aviemore Photographic

A maltster turns the germinating barley in the traditional malting process known as "floor malting." This type of malting requires controlling the germination process manually through regular raking to ensure that hot spots do not develop, causing the malt to develop unevenly. Many modern maltsters no longer use floor malting and favor the use of mechanized drum malting systems. Floor malting is still practiced, however, and some brewers feel that it creates fuller, nuttier-flavored base malt.

By **Terry Foster**

Beer Starts Here
BASE MALTS

Like any structure beer must have a foundation, which is what we call "base malt." With malt extract the choice of base malt has been made for you, but in the case of a partial mash/extract beer, or one from all-grain you have to choose it yourself. But before we get ahead of ourselves, what is base malt and what does it do in a beer?

Well, one of the most defining characteristics of beer is that it contains alcohol, which has been produced by the action of yeast on sugars. Not just any sugars, for there are some that yeast cannot ferment, but primarily simple sugars such as glucose, maltose, sucrose and to a lesser extent, maltotriose. These are produced in beer wort by enzymes that convert the starch in base malt to sugars during mashing. And of course the malt itself is derived from barley;

BASE MALTS BY THE GLASS

1. Pilsner malt is used to brew traditional Czech or German Pilsners. 2. Munich malt is used in Oktoberfests and many German lagers, like dunkel. It also shows up in ales, from IPA to porter. 3. Pale ale malt is like two-row, but is kilned at a higher temperature. This flavorful malt is used to make ales, especially traditional English ales. 4. Vienna has a malty flavor profile. It's used in Vienna lagers. 5. Pale malt is the most common base malt. It's used as the sole base malt in 95 percent of all beers.

Photos by Ian Mackenzie

there are other malts, notably wheat malt, which can perform this conversion, but they are generally used as base malts in a limited range of special beers, (and these will not be covered in this story.)

Base malts are the brewer's workhorse, and form the largest proportion of the malt bill, usually at least 60–80% of the total. They are the beer's source of alcohol, flavor foundation, some of its mouthful and body, and permit us to use whatever specialty malts and non-barley based grain starches we want to add. There are really only six of these, and they are as follows: pale malt, pale ale malt, Pilsner malt, mild ale malt, Vienna malt and Munich malt.

The first four can be used as the sole malt in the grain bill, and are true base malts. Vienna malt can also be used in this way although it is more often used in conjunction with pale malt. Munich malt (the very low roasted, low color versions – see later) can also be used as the sole source of fermentable sugars, but again is usually used alongside pale malt. In that sense these two are not really base malts, but I have included them because they are used in greater proportions of the malt bill than specialty malts.

Pale and Pale Ale Malt

These are the most important base malts and are used as such for the majority of beers brewed by craft and homebrewers. There are two basic types, 2-row and 6-row, which refers to the type of barley from which they are made. Six-row pale malt is very high in enzyme content and can hence handle quite high proportions of non-malt starchy grain adjuncts. Large commercial brewers mostly use them in this way since they are also high in protein, which can cause chill hazes in the final beer, unless low-protein adjuncts are added to lower the total protein content of the wort. Craft and homebrewers generally produce all-malt beers to get the kind of flavors they want, and prefer to use 2-row types partly to reduce the risk of chill haze formation, and partly because they help to give superior flavors.

At one time there was a big distinction between pale ale malt and 2-row and 6-row pale malt (as well as European lager malts), pale ale malt being held to be "well-modified," more so than the other base pale malts. What this meant was that the malting and kilning process for pale ale malt had been taken a little further along so that all that was needed to maximize extract from the malt was a single-temperature infusion mash. In contrast, US and European 2-row malts needed to go through a programmed schedule of gradually increasing temperatures to control both wort protein levels and to optimize extraction. Indeed, the process of decoction mashing, where the temperature increases are made by withdrawing a portion of the mash, boiling it and returning it to the main mash may well have arisen as a way to handle poorly-modified malts. That was then; modern pale malts are of much higher quality, and pretty much all well-modified enough to be converted by a single temperature infusion mash. But, programmed upward infusion is used by a number of brewers for brewing certain beers to reduce wort protein and to

give wort with somewhat different fermentability and therefore beer flavor profile. Some lager brewers still prefer to carry out a time-consuming decoction mash as they feel it produces a richer flavor, especially in something like a bock beer. But in most cases you will get as good a result as you want by using a simple single temperature infusion, and I would recommend this approach to all homebrewers.

So if they are both well-modified what then is the difference between pale malt and pale ale malt? Well, there may be slight flavor differences (read on), and even in maximum yields obtainable, but the latter are insignificant in practice. The main practical difference is principally that of color, with US 6-row and 2-row pale malts coming in at around 1.7–2.0 degrees Lovibond (°L), and UK pale malt at 2.5–3.5 °L. There is one other difference and that is in enzyme content, with US 6-row pale malt being the highest, US 2-row somewhat lower, and UK pale ale malt lower still. That is why 6-row pale can handle high levels of starchy adjuncts, but unless you plan to brew a high adjunct beer, we do not need to worry about the lower enzyme levels in 2-row and pale ale malt. With an all-malt beer these grains contain sufficient enzymes to achieve complete conversion in the mash, and to convert any residual starch, which may be present in specialty malts.

Exactly how much of these base malts you use in a particular beer depends upon a number of things, such as the alcoholic strength and what specialty malts may be needed for a particular style. Here I can deal only with strength, which is directly related to the yield you can get from the malt. So, what sort of yield can you expect from pale and pale ale malts? At a maximum (which means under ideal conditions) you will get an original gravity of 1.038–1.040 (9.5–10.0 °P) for the extract derived from 1 lb. (0.45 kg) of malt in 1 US gallon (3.8 L) of water. As you probably know, you will not get that sort of yield in practice, and *BYO* bases recipes on a brew house efficiency of 65%. That means that you can expect to get yields of 1.025–1.026 (6.3–

6.6 °P) from 1 lb. in 1 gallon.

Here is an example: Let's say you want to brew 5 gallons (19 L) of a beer with an original gravity of 1.050 (12.5 °P), which for simplicity will be brewed with only pale malt. Then you will need total gravity points of 5 x 50 = 250. But pale ale malt gives 1.026 SG/lb./gallon, so we shall need 250/26 = 9.6 lb. (4.4 kg) of this malt.

Floor Malting

There is another type of pale ale malt, which is malt that has been floor malted. Most malts are produced via a drum malting process, during which the raw barley is first steeped in water until it has absorbed the appropriate amount of moisture, and then allowed to germinate. The drum is rotated and the temperature and moisture level of its contents are carefully controlled to ensure uniform germination of the barley. Once germination has proceeded sufficiently far, the green malt is then be kilned to dry it. In the case of pale and pale ale malts this is done over a lengthy period, with the temperature rising slowly up to a maximum of about 170–180 °F (77–82 °C), depending upon exactly what the maltster intends to achieve. Generally pale ale malt is kilned at a slightly higher temperature than pale malt, hence its higher color. The great advantage of drum malting systems is that it permits the maltster to control the whole process to produce a high quality, uniform product.

Floor malting is a much older, more traditional, process than drum malting, although at first sight it seems the same in that it involves the identical stages of steeping, germination and kilning. The big difference is that in the germination stage the steeped barley is spread in a thin layer ("couch") on a floor. The germination has then to be controlled manually, in order to ensure uniform progress during growth. The big problem is temperature control, for considerable heat is generated by the germinating grain. This is done in two ways the first being by controlling atmospheric temperature by opening or closing louvered windows in the walls. The second way is by regular "turning" of the grain to ensure that hot spots do not develop in the bed. This is a totally manual process, carried out by men walking on the bed and turning it using wooden rakes and spades (see photo on page 42).

The main barley variety used in floor malting in Britain is Maris Otter, and with this the result is a plump rounded malt, perhaps a little darker in color than other pale ale malts at 3–4 °L. Opinions vary on its quality, but many brewers think that it adds a fuller, more rounded and even nuttier flavor to pale and bitter ales and IPAs than other pale ale malts.

Beyond the Pale

Now, I have largely talked about pale and pale ale malts in the context of pale beers, but they are also the base for nearly all kinds of beer, from pale lager

to dark imperial stouts, and the question is whether it is always necessary to distinguish between them, or can they be considered as being interchangeable? It is partly a question of taste and some brewers would never use 2-row pale in a pale ale, or pale ale malt in a light lager. Others see 2-row malt as true workhorse and use it in every beer. Personally, I do not see the differences as being important in a beer brewed with a significant proportion of specialty malts. In other words, if the main flavor notes in the beer are caramel, biscuit, roasted and so on, these are going to dominate anything the base malts can supply, except for perhaps some body, which really comes from the mashing temperatures used. Therefore, in such beers you can use whatever base pale malt you prefer or happen to have on hand.

Pilsner Malt

This is a version of pale malt, but is lighter in color (1–2 °L) than those discussed earlier, and is slightly less modified than they are. Do not be fooled by that statement, for it is modified well enough to be used by a single-temperature infusion mash. And it will give about the same extract yield, 1.025–1.026 per lb. per gallon at our 65% brewhouse efficiency. It gives a lighter, crisper flavored beer than other pales, and as its name suggests is ideally suited to the brewing of pale yellow Pilsner beers, in which it is the only malt used. There is generally no advantage to using this malt in any kind of fuller-flavored or darker beer since in those styles the characteristics the malt is designed to produce would be lost.

Mild Ale Malt

This is produced just as pale ale malts, but is kilned at a slightly higher temperature, and is therefore a little more colored than them at around 3.5–4.5 °L, but still has a sufficiency of enzymes for most malt bills. As with the others it will yield around 1.025–1.026 per lb. per gallon at 65%, and can be mashed by the single-temperature approach. It gives a roasty, slightly sweeter and fuller flavor than pale ale malt, and can be used to advantage in mild ales as you

might expect. Mild ales, which of course start at a low gravity, can be very light, bland and even boring, but if this malt is used as the base they can be almost luscious and even nutty on the palate. Further, mild ales are often brewed with a proportion of roasted malt, whose harshness can easily make the beer unbalanced, and mild ale will nicely balance that. But there is no reason, apart from that of color, to limit use of this malt to mild ales for it works well as a base in many beers, especially in dark ones.

Vienna Malt

This is another malt kilned slightly more than the pale ale malts, which may be made from either European 2-row and US 6-row barleys. It is relatively high in color (3–5 °L), and gives a slightly lower yield than pale malts, namely 1.023–1.024 per lb. per gallon for our 65% efficiency. Like our other base malts it has a significant enzyme content and can be fully converted in a simple infusion mash, but it often does not have enough enzymes to handle starches from adjuncts or specialty malts. It was originally designed for brewing Vienna lagers, however, it can be used in other beers, and I particularly like it in an IPA because it adds a nice red hue to the beer and adds some maltiness as well, which nicely balances with the high hop level of IPA.

Munich Malt

This is the highest kilned malt in this range and may be as high as 30 °L in color. However, I am talking about lower kilned versions, which come in at 8–11 °L. It does contain enzymes and can be infusion mashed, giving a yield similar to that of Vienna malt, of 1.023 per lb. per gallon. However, it is rarely used on its own, and I would always use it in combination with a pale malt, so it is only a quasi-base malt. But it does add a toasty flavor in a beer, as well as providing some good mouthfeel. I use this malt in a lot of beers, especially in pale and bitter ales where I want a little more body and flavor than I can get by simply using the more "normal" pale ale malt/crystal malt combination. BYO

Photo by Charles A. Parker/Images Plus

"There are many styles that can give you all the malt flavor you can handle . . ."

MALT MADNESS

By **Justin Burnsed**

I'm always amazed by the fact that nature provided us with such a perfect ingredient to brew beer with. In their raw form, brewing grains are like a small safe needing just the right combination for access to all the wonderful things they bring to the brewing table. Once in the hands of a capable locksmith — aka the maltster — the door to enzymatic power and starch is unlocked. When the newly malted grains hit the kilning phase, that is when the resulting flavor is forever determined based on the methods and temperatures used to dry them.

So what is the purpose for bringing all of this up? You're familiar with the term liquid bread right? It sure as heck didn't come from a funkadelic Flanders red or a triple IPA, I can tell you that much! I am of course referring to malt-forward beers and the variety of delicious aromas and flavors they have brought to human kind for ages. Let's get right down to it and see what makes these beers tick.

What "Malty" Means

First and foremost, I think we should spend a little time on what the term malty actually means. I know that from a consumer's standpoint the common misconception is that when your local pint slinger says the beer you just pointed to is malty, that means get ready for a thick, chew your way through, incredibly sweet beer. Now that can be true with a handful of styles if they are brewed a certain way, but it is more the exception than the rule. Sweetness can increase the perception of malt flavor, but they are not one in the same. There are many styles that can give you all the malt flavor you can handle and still remain fairly balanced, so let's just bury that rumor right now.

A malty beer should be just that, a

Photo courtesy of istockphoto.com

Some of the most classic beer styles in the world showcase their malts (while restraining the hop presence) such as southern English brown ale, Munich helles and Scotch ale.

celebration of the malts that you have selected as the basis for why you are brewing this beer in the first place. It should accentuate every bit of the grainy, bready, nutty, biscuity, fruity, toasty and any other flavor/aroma descriptors you can use to identify with your favorite malts. The major rule of thumb here is to not add anything to the beer that takes away from these characteristics. You should only add ingredients that help shine the spotlight on them even brighter. It can also come down to what you don't add to the brew day ingredient list that will help you taste the results of what malted goodness is all about.

The Grains

Let's now dive into the heart of the matter, the malted grains themselves. We know there's a huge variety available these days, but the question at hand is which of them are best used in this type of beer? The answer could easily be style driven based on traditional ingredients, so consulting existing recipes may help point you in the right direction. There are varying degrees of "malt flavor" in the malts themselves, so let's just assume you are making a non-traditional beer of your own design and go over the major players that are accessible to most homebrewers.

Let's begin with your options in the base malt category. On the cleaner tasting, lighter end of the spectrum you've got your pale 2-row, 6-row, Golden Promise, wheat and rye malts. These have been kilned at a low temperature and for a short amount of time (1 to 3 °L), so that they can provide optimal enzyme to starch ratios and primarily act as a blank canvas, if you will. That is part of the reason they are rarely used alone and are usually combined with specialty malts or unique yeast strains. When you are looking to step up the malt flavor a bit, you can look to some of the more traditional malts from Europe. Vienna, Maris Otter, pale ale and Pilsner malts (1.6 to 4 °L) all have a more distinctive taste and with the exception of the Pilsner malt are kilned a touch longer to bring out a fuller flavor. The most intensely flavored base malts are going to be both light and dark Munich malts (8 to 15 °L). These are kilned about as far as you can go to bring out the most flavor while preserving just enough enzymes for total conversion when used as 100% of the grain bill. Munich malts provide a sweet, toasted and sometimes fruity flavor to the brew. It is often combined with other base malts especially in the case where specialty malts with zero diastatic power are part of the recipe.

As for the specialty malts, there are a handful that will allow you to stay on the course of maltiness without getting into the roasted and caramel-like flavors that are more process derived. Don't get me wrong, a touch of roasted barley in your strong Scotch ale or crystal malt in your English southern brown is just fine and dandy. The focus here is how to emphasize the inherent flavor of the malted grain itself. If you truly want to embrace this theme, any significant addition of specialty malts should be within the color range of 19 to 28 °L.

Four malts that I personally love to use for this very purposed are Victory®, aromatic, biscuit and melanoidin. These can be used in varying degrees from 1 to 20% of the total grain bill depending on which one or combination you plan to use. Each one of them significantly bump up your malt factor by bringing their own uniquely intense bready and/or biscuity flavors/aromas to your beer.

For extract brewers, the choices are going to be fairly limited in comparison to the all-grain brewers when it comes to the variety of extracts you can use. The light, wheat and Pilsner extracts (2 to 6 °L) can add a mild, clean malt flavor for the lighter styles. If you are looking to brew something a bit more intense like a Märzen or a Doppelbock, amber or Munich malt extracts (8 to 10 °L) are widely available these days and will add flavors similar to the heavier base malts described earlier. If you have the proper equipment (grain bag), steeping some Munich or one of the other aforementioned specialty malts will

also add more depth of flavor to your malty brew.

Hops for Malty Beers

The next ingredient we need to discuss is hops. With all the crazy hopped-up beers running around these days, it can be hard to pull back the reins a bit when deciding what to add to a malt-focused beer. I'm not going to tell you that you should only add a pinch of hops at the beginning of your boil and walk away. That would only yield a fairly undrinkable beer that would be better suited over your grandma's famous pound cake than in your pint glass. What I will say is this: try to avoid any heavy doses of hops beyond 15 minutes from the end of the boil. If you do, it should be no more than a 0.5 oz. (14 g) per 5-gallon (19-L) batch and not be of a variety that is very pungent like Simcoe® or Nelson Sauvin. Do not — I repeat, do not — even think about dry hopping a malt-focused beer. That will defeat the purpose of what you are trying to achieve faster than over bittering.

Since we are on the subject, let's talk about where you should aim when it comes to bitterness. This is also an area that is style dependent, should you choose to replicate one in particular. There are styles that are malty and sweet like a strong Scotch ale, and there are styles that are malty and somewhat dry like a Munich helles. This all comes down to the BU:GU ratio (bitterness units/gravity points) which helps us estimate the balance of the finished beer prior to brew day. For a malty beer to truly keep its flavor from being derailed by excessive amounts of iso-alpha acids, while also not become too cloying and sweet, I am firm believer that you need to fall within 0.25 to 0.55. The high end of that number is really reserved for styles like an English barleywine that are typically aged for months, sometimes years which leads to the degradation of hop compounds, and this is why you want to overshoot your targeted IBUs.

Our next stop is to determine what exactly should be steaming up in your hot liquor pot. Other than the obvious H_2O molecules that should be dancing around inside, there will likely be a variety of other compounds hanging out as well. Making a malty beer doesn't require a whole heck of a lot of other considerations in addition to what you normally need to keep an eye on: No chlorine, make sure your mash pH isn't too high from over alkaline water, no excess amounts of heavy metals, etc. The one thing you may want to consider measuring is the amount of sulfate you've got in there. High amounts (150 ppm to 350 ppm) are fine for hoppy beers, but malty beers . . . not so much. They can end up having a very sharp bitter taste if sulfate levels get too high. Calcium chloride can be added to combat this if you have no other options, up to 100 ppm. If you are starting with reverse osmosis or distilled water, and are accustomed to adding salts to your mash, I would add the appropriate amounts for the proper pH in relation to beer color, strength, and water to grist ratio as you normally do. My only recommendation would be to stay closer to an even ratio of gypsum and calcium chloride than you would with hoppy brews.

Yeast

The plot thickens a bit as we begin to discuss possible yeast strains. I really hadn't thought about the major difference between lager and ale yeasts when specifically applying it to malty beers until writing this article, and the conclusion is quite clear now. Lager strains allow for a more malt-focused beer. It's actually quite simple. During normal fermentation temperatures, lager strains do not produce as many flavor compounds as ale strains. Since there are less compounds for your nose and taste buds to take in, the malt derived compounds represent a larger portion of what is perceived overall. I thought back to a Spaten Optimator I had a couple months ago and found myself asking the question, "If that were an ale, would I be tasting all this malt right now?" My answer was no.

Since I know that most of us are brewing ales almost entirely because of the reduced time and less temperature control it demands for most of the year, I will say that we can all make a perfectly great malty brew that way too. To keep the focus where it should be, I would avoid any strains that produce excessive amounts of esters and phenolic compounds. I would also ferment at a temperature at the lower end of the range that is acceptable for that strain to keep the finished beer a bit cleaner tasting. There are strains that are promoted as producing a maltier beer, but they are really just adsorbing more alpha acids and impacting the finished BU:GU ratio which will increase the sweetness a little. An example would be some of the English strains, but they also tend to be a little fruiter too. I would go with whatever is style appropriate and just keep the temperature down.

Adjuncts and Extras

As far as adjuncts and spices go, I am sure that you can read between the lines, as a general rule my advice would be to just avoid them. Exceptions to this are flaked barley, or oats that add body to the beer and wouldn't really take away any of the flavor you are trying to achieve. Sugars can be used as a wort extender if you really need the extra gravity points, but don't go overboard. The yeast will start to do some crazy stuff, and an excessively thin-bodied beer won't do your hand selected malts any justice.

Malty Brewing Methods

Now we can turn our attention to the brewing process and how that can impact this type of beer. Once you've determined the ingredients you are going to use, there really is no way to directly add additional unadulterated malt flavor to the beer. That doesn't mean there are indirect ways to influence it. As mentioned before, we know sweetness can increase the perception of malt. In addition, so can a full body and often those two go hand in hand. As with most of these variables, the style can help guide the way.

If we were to try and create a massive-sticky strong Scotch ale, the likes that would cause the British Parliament to grant William Wallace's

Continued on page 57

Bob's Your Uncle (Southern English Brown Ale)

(5 gallons/19L, all-grain)

OG = 1.044 FG = 1.013
IBU = 14 SRM = 23 ABV = 4.1%

Ingredients

8.0 lbs. (3.6 kg) Maris Otter pale ale malt
0.75 lbs. (0.34 kg) crystal malt (120 °L)
0.4 lbs. (0.18 kg) Carafa® II
3.75 AAU Kent Goldings hops (0.75 oz./21 g of 5.0% alpha acids) (60 min.)
1 tsp Irish moss or 1 Whirfloc tablet (15 min)
White Labs WLP 013 (London Ale Yeast) or Wyeast 1028 (London Ale) yeast
0.75 cup (150 g) priming sugar (if bottling)

Step by Step

Mill the grains. Dough in using 2.5 gallons (9.5 L) of water with a target mash holding temperature of 155 °F (68 °C). Hold the mash temperature for approximately 60 minutes or until the conversion is complete. Raise the temperature of the mash to 168 °F (76 °C) and begin sparging with 170 °F (77 °C) water until you collect 6.0 (22.7 L) gallons of wort in the kettle.

Total boiling time for this recipe is 60 minutes. Add the Kent Goldings hops at the start of the boil. Add the Irish moss or Whirfloc tablets when 15 minutes remain in the boil. After the boil is finished, chill the wort to 70 °F (21 °C), transfer to your fermentation vessel and aerate the wort adequately.

Add yeast to the chilled wort. Ferment around 70 °F (21 °C) until the final gravity is reached, which should be in five to seven days. Rack to a secondary vessel and allow the beer to mature for another five to seven days around the same temperature (70 °F/21 °C). Your beer is now ready to rack into a keg, or bottles along with the priming sugar.

Bob's Your Uncle (Southern English Brown Ale)

(5 gallons/19 L, extract with grains)

OG = 1.044 FG = 1.013
IBU = 14 SRM = 23 ABV = 4.1%

Ingredients

5.4 lbs. (2.4 kg) Muntons Maris Otter light unhopped liquid malt extract
0.75 lbs. (0.34 kg) American crystal malt (120 °L)
0.4 lbs. (0.18 kg) Carafa® II
1 tsp. Irish moss or 1 Whirfloc tablet (15 min.)
3.75 AAU Kent Goldings Hops (0.75 oz./21.2g of 5.0% alpha acids) (60 min.)
White Labs WLP 013 (London Ale Yeast) or Wyeast 1028 (London Ale) yeast
0.75 cup (150g) priming sugar (if bottling)

Step by Step

Mill the specialty grains. Place the milled grains in a grain bag. Steep them in 2 gallons (7.6 L) of 156 °F (69 °C) water for 30 minutes. Rinse the grain bag with about 2 quarts (1.9 L) of water and allow it to drip into the kettle for about 15 minutes, but be sure not to squeeze the bag to prevent extracting harsh tannins from the grain husks. Add enough water for a pre-boil volume of 6.0 gallons (22.7 L). Stir in the malt extract with heat off to avoid scorching, then begin the boil.

Total boiling time for this recipe is 60 minutes. Add the Kent Goldings hops at the start of the boil. Add the Irish moss or Whirfloc tablets when 15 minutes remain in the boil. After the boil is finished, chill the wort to 70 °F (21 °C), transfer to your fermentation vessel and aerate the wort adequately.

Add yeast to the chilled wort. Ferment around 70 °F (21 °C) until the final gravity is reached, which should be in five to seven days. Rack to a secondary vessel and allow the beer to mature for another five to seven days around the same temperature (70 °F/21 °C). Your beer is now ready to rack into a keg, or bottles along with the priming sugar.

Tips for Success

One of the keys to brewing both of the malty beer recipes here (the recipe on this page, as well as Great Scot on the facing page) is making sure you pitch enough healthy yeast. Pitching a single packet of yeast into a 5-gallon (19-L) batch does not always give your beer enough yeast cells to efficiently ferment the wort. Beers made from underpitched worts start slower, and this slow start can leave the wort open to the growth of microorganisms such as bacteria or wild yeast. Consider making a yeast starter a day ahead of your brew day to generate a healthy population of yeast before pitching. A general rule of thumb for pitching ale yeast is that you need one million (1.0 x 106) cells per milliliter of wort per degree Plato. Visit http://byo.com/yeaststarter for more information about making a yeast starter, as well as a table for recommended starter sizes for a variety of worts. Visit www.mrmalty.com for a useful pitching rate calculator (as well as more malty brewing tips).

Great Scot!
(Strong Scotch Ale)
(5 gallons/19 L, all-grain)

OG = 1.077 FG = 1.021
IBU = 25 SRM = 29 ABV = 7.2%

Ingredients:

13.5 lbs. (6.1 kg) Golden Promise malt
1.25 lbs. (0.57 kg) Briess Victory® malt 28 °L
10 oz. (0.27 kg) British caramel malt (70/80 °L)
3 oz. (85 g) roasted barley (550 °L)
3 oz. (85 g) peated malt
6.9 AAU Willamette hops (1.25 oz./35 g of 5.5% alpha acids) (60 min.)
1 tsp. Irish moss or 1 Whirfloc tablet (15 min.)
White Labs WLP028 (Edinburgh Scottish Ale Yeast) or Wyeast 1728 (Scottish Ale Yeast) yeast
0.75 cup (150 g) priming sugar (if bottling)

Step by Step

Mill the grains. Dough in using 5 gallons (19 L) of water with a target mash holding temperature of 156 °F (69 °C). Hold the mash temperature for approximately 60 minutes or until the conversion is complete. Raise the temperature of the mash to 168 °F (76 °C) and begin sparging with 170 °F (77 °C) water until you collect 6.0 gallons (22.7 L) gallons of wort in the kettle.

Total boiling time for this recipe is 60 minutes. Add the Willamette hop addition at the start of the boil (60 min.). Add the Irish moss or Whirfloc tablets when 15 minutes remain in the boil. After the boil is finished, cool the wort to 70 °F (21 °C), transfer to your fermentation vessel and aerate the wort adequately. Add yeast to the chilled wort. Ferment around 70 °F (21 °C) until the final gravity is reached, which should be in five to seven days. Rack to a secondary vessel and allow the beer to mature another five to seven days around the same temperature. Your beer is now ready to rack into a keg or bottles along with the priming sugar.

Great Scot!
(Strong Scotch Ale)
(5 gallons/19 L, extract with grains)

OG = 1.077 FG = 1.021
IBU = 25 SRM = 29 ABV = 7.2%

Ingredients

9.1 lbs. (4.1 kg) light liquid malt extract
1.25 lbs. (0.57 kg) Briess Victory® malt 28 °L
10 oz. (0.27 kg) British caramel malt (70/80 °L)
3 oz. (85 g) roasted barley (550 °L)
3 oz. (85 g) peated malt
6.9 AAU Willamette hops (1.25 oz./35 g of 5.5% alpha acids) (60 min.)
1 tsp Irish moss or 1 Whirfloc Tablet (15 min.)
White Labs WLP 028 (Edinburgh Scottish Ale Yeast) or Wyeast 1728 (Scottish Ale) yeast
0.75 cup (150 g) priming sugar (if bottling)

Step by Step

Mill the specialty grains. Place the milled grains in a grain bag. Steep them in 2 gallons (7.5 L) of 156 °F (69 °C) water for 30 minutes. Rinse the grain bag with about 2 quarts (1.9 L) of water and allow it to drip into the kettle for about 15 minutes, but be sure not to squeeze the bag. Add enough water for a pre-boil volume of 6.0 gallons (22.7 L). Stir in the malt extract off heat to avoid scorching, then begin the boil.

Total boiling time for this recipe is 60 minutes. Add the Willamette hop addition at the start of the boil (60 min.). Add the Irish moss or Whirfloc tablets when 15 minutes remain in the boil. After the boil is finished, cool the wort to 70 °F (21 °C), transfer to your fermentation vessel and aerate the wort adequately. Add yeast to the chilled wort. Ferment around 70 °F (21 °C) until the final gravity is reached, which should be in five to seven days. Rack to a secondary vessel and allow the beer to mature another five to seven days around the same temperature. Your beer is now ready to rack into a keg, or bottles along with the priming sugar.

Tips for Success

Traditional Scottish breweries originally drew water from underground sources. Although some no longer have private wells, soft water remains the ideal base for a malty Scotch ale. If you want to brew maltier styles like Scotch ale, and you haven't done so already, request a water report from your town or city (if you are using a municipal water source) or have your home water supply tested to find out what is in your water. (Read more about the basics of water reports in "Beginner's Block" in the July-August 2012 issue of *BYO*.)

If you feel that your water needs adjusting, download Greg Noonan's "water witch" water chemistry spreadsheet from the Web at http://www.byo.com/resources/brewwater. For more tips about brewing water, visit http://byo.com/watertips for more information. If you like this recipe and style, be sure to read Greg's book Scotch Ale, from the Classic Beer Style Series (Brewers Publications) for more advice about Scotch ales.

Malt-Focused Beer Styles

To find the finest examples of malt forward beers, it is best to look to the places where these beers were first created. Long before US brewers put their spin on these classic styles, Europe (specifically Germany and the U.K.) had a long-standing tradition of producing beers that accentuate the ingredient at the heart and soul of our favorite beverage. To save you from redundancy, you can assume that the preferable level of hop flavor and aroma is very low to none for all the styles listed. These are all about the malt.

ALES

English Barleywine

O.G. 1.080–1.120 F.G. 1.018–1.030
SRM 8–22 ABV 8–12%
IBU 35–70

This strong, full-bodied and complex style has a long history as the beer that signals the coming of the holiday season in England. A rather simple grain bill consisting of pale ale malt and a small amount of caramel malt (Under 10%) is all you need to produce a fine English barleywine. Caramelization is provided by extended boil times that typically range from 90 minutes up to three hours. The hopping rate may seem to be a bit on the high side for a malty beer, but that is necessary to offset the high gravity and to compensate for the fading of bitterness over time as barleywines are typically aged for a minimum of four months to a few years before serving. The flavors/aromas commonly associated with the style are biscuity, toasty, fruity, toffee-like and also Sherry notes in aged versions.

Southern English Brown

O.G. 1.033–1.042 F.G. 1.011–1.014
SRM 19–35 ABV 2.8–4.1%
IBU 10–20

This was created as a middle ground between the more common milds and porters of the early 1900s. Despite its relatively low alcohol content, it is designed to pack a fair amount of flavor with the addition of both of roasted and dark caramel malts to a mostly pale ale malt grain bill. The resulting beer should be less roasty than a porter, but darker and more full flavored than a mild. Dark fruit, caramel, and toffee are aromas/flavors commonly associated with the style. The balance should lean a little toward the sweet side.

Strong Scotch Ale

O.G. 1.070–1.130 F.G. 1.018–1.056
SRM 17–35 ABV 6.5–10.0%
IBU 14–25

Given that Scotland is well known for producing some of the world's finest malted barley, it should come as no surprise that this style is considered by many to be the pinnacle of maltiness. The signature sweetness of a Scotch ale usually comes from a heavy dose of pale ale malt, moderately attenuating yeast, a high mash temperature and a very low hopping rate. The caramel notes commonly associated with the style can be produced by a long boil and/or a small crystal malt addition which may also be used for color adjustment. Slightly roasted and smoky flavors are also acceptable and can be achieved by adding a touch of highly roasted or peat smoked malt, but each of those should never exceed more than 3% of the total grist.

LAGERS

Doppelbock

O.G. 1.072–1.112 F.G. 1.016–1.024
SRM 6–25 ABV 7–10%
IBU 16–26

As the precursor to the biggest and maltiest lager of the land known as the Eisbock, the Doppelbock is in its own right the king of the hill for those of us that don't feel like going the extra mile to freeze distill our beer. For the Bavarians, this beer is usually reserved for special occasions due to its extended lagering times and obvious potency. Given the style's wide range of color, a multitude of combinations using Pilsner, Vienna, Munich and even roasted malts (in small quantities) is acceptable. This style can also display varying degrees of sweetness as the level of bitterness tends to be a bit higher in the lighter versions of the style and lower in darker ones. Flavor and aromas can range from intensely bready, slightly fruity, to a hint of chocolate, but never burnt. Rich maltiness should shine through no matter what version is brewed.

Munich Helles

O.G. 1.045–1.051 F.G. 1.008–1.012
SRM 3–5 ABV 4.7–5.4%
IBU 16–22

This style is living proof that a malty beer can also be light in color, not too heavy and fairly balanced. Think of it as a Pilsner with the reins pulled back on the bitterness, hop flavor and aroma. Munich Helles is a single malt beer, so all you'll need is some good ole Pilsner malt and a touch of German noble hops to brew this one. Well attenuating, clean lager yeast should be used to produce a nice dry finish.

Vienna Lager

O.G. 1.046–1.052 F.G. 1.010–1.014
SRM 10–16 ABV 4.5–5.5%
IBU 18–30

In contradiction to its namesake, this style is rarely brewed in its area of origin these days as it emigrated along with the people who brought it to Mexico in the late 1800s. Traditional versions are reddish-gold to amber color, which is typically derived from using a combination of Vienna and Munich malts. This is where the lightly toasted flavor/aromas also come from. Use just enough German noble hops to result in a beer that lands right in between bitter and sweet.

dream of a free Scotland, you'd probably want to mash at a high temp of 156–158 °F (69–70 °C) and go for a fairly thin mash. If instead we really had our heart set on doing a Munich Helles that would make the Kaiser himself rise from the grave to yell "Prost!," you'd likely shoot for 148–150 °F (64–66 °C) with a thicker mash to achieve the low final gravity that style requires.

Prior to the beginning of the boil, especially when brewing the high gravity styles of beer, you can cut off the runoff of the wort a bit short to keep from diluting it with the final runnings. Doing this can yield a more concentrated wort, which in turn concentrates malt flavor. It is a great way to get a higher gravity reading if your mash tun is undersized. The obvious downside being less beer to share with your friends, but you weren't going to do that anyway right!?

Traditionally some of the maltier styles can benefit from alterations to your normal boiling regimen. Extended times in the kettle will also get you a more concentrated wort and also adds a bit of caramelization via the Maillard reaction. Those flavors complement a malt-forward beer quite nicely and are appropriate in a few of the high ABV styles. You can go all the way up to three hours where appropriate, just know that your finished beer may end up a little darker than planned.

We've pretty much covered fermentation already, but I would like to reiterate that a lower temperature, preferably in the mid 64–67 °F (18–19 °C) range for ales will result in a beer that doesn't display too many yeast characteristics and will let the malt shine.

Once you're ready to package the beer, you should carbonate to a level that is recommended for the style nearest to your creation. Typically the lagers will have the highest amount, followed by the lower ABV ales and finally the stronger ales 7%+ with the lowest levels. Aging can be quite beneficial with the stronger styles as mild oxidative flavors can impart a dessert wine-like elegance to a malty beer over the course of a year, five years, perhaps even 20 years if cellared properly.

Related Links:

- For more about brewing dopplebock, visit: http://byo.com/doppelbock
- For more tips about brewing English barleywine, visit: http://byo.com/story168
- For a great Munich helles recipe, visit: http://byo.com/story746
- For more information about brewing Scotch and Scottish ales, visit: http://byo.com/story1354
- For Mr. Wizard's advice for brewing malty beers, visit: http://byo.com/story1951

FOR THE LOVE OF THE GRAIN

By Sean Z. Paxton

Save the spent grains left over from your homebrewing sessions in airtight containers. You can use them later to make all kinds of flavorful food recipes.

Photos by Sean Z. Paxton

SPENT GRAIN . . . EVERY BREWER ENDS UP WITH SOME.

Once the malt has given up its fermentables for beermaking, it is usually disposed of via the local city green waste, composted or barreled up and given away to farmers for animal feed. Animal feed makes a great deal of sense, as spent grain is rich in nitrogen (protein), phosphorus, potassium, calcium and magnesium, all perfect additives to an animal farmer looking for easy feed for their herd. The question that comes to mind, however, is what can a homebrewer do with spent grain in the kitchen? How can the byproduct of brewing be used as a resource and become a standard ingredient in your kitchen pantry. This is an opportunity to capitalize on the possibilities of spent grain and transform it into useable substrates.

Before using spent grain as a cooking ingredient, it is important to think a little more about this product, its components and how it is transformed during the brewing process. When spent grain is emptied from the mash-tun, it is not only hot and wet, but depending on the grist make up and the beer style brewed, the taste can vary.

Let's start with the moisture content. Each home and commercial brewer uses a different mill, dialed to a different setting. This will change the extraction of each grain, ultimately changing the final gravity of the wort and what is left behind in the spent grain. Next, it is important to look at the lautering process, how long was the grain sparged and what kind of grate/screens are used to hold the kernels back from entering the kettle. These variables change the water content to the remaining nutrients. The average moisture content for spent grain can range from 66 to 77%.

BEFORE USING SPENT GRAIN AS A COOKING INGREDIENT, IT IS IMPORTANT TO THINK A LITTLE MORE ABOUT THIS PRODUCT, ITS COMPONENTS AND HOW IT IS TRANSFORMED DURING THE BREWING PROCESS. WHEN SPENT GRAIN IS EMPTIED FROM THE MASH TUN, IT IS NOT ONLY HOT AND WET, BUT DEPENDING ON THE GRIST MAKEUP AND THE BEER STYLE BREWED, THE TASTE CAN VARY.

Spent grains can be used as an aromatic cooking medium. For example, use them as a base for roasting garlic (above).

Spent Grain Prep

While there is not too much work involved in getting your spent grains ready for cooking — after all you've already done the work of brewing the beer — there is a bit of prep work you need to perform, depending on what form of spent grains you plan on using in your next kitchen project. Prepping your spent grains will also help you store them for longer periods before you are ready to cook with them.

Wet Spent Grain

To help define spent grain for this first discussion, let's call this category "wet spent grain." To store wet spent grain longer, take a rimmed sheet tray, lined with a silcone sheet tray liner (such as a Silpat®) or parchment paper, and spread the grain out to a thickness of 1 to 2 inches (2.5 to 5 cm), allow it to cool to room temperature and then place the entire sheet pan in a refrigerator for another few hours. Once the temperature of the grain has dropped to 38 °F (3 °C) or lower, it can be bagged up in to zipper-style storage bags and kept in the refrigerator for up to a week. If the spent grain is not cooled down properly, microbial growth can easily occur, leaving a telltale smell, making the spent grain inedible. If the wet spent grain can't be used promptly, it can also be frozen. Save yourself the burden of huge bags of spent grain in the freezer and portion out the bags on a kitchen scale to a standard weight of 1 pound (0.45 kg) each, making them easier to use in recipes and for stacking in the freezer.

Dry Spent Grain

If the goal is to use spent grain more frequently in baked goods or for other uses, a good protocol is to dry it. This category I will call "dried spent grain." Start by taking the fresh spent grain from the mash tun and transfer it to rimmed sheet trays lined with a Silpat® or parchment paper and spread out the grain to a thickness of 1 to 2 inches

Spent Grain Recipes

Mango "Wit"-Flavored Spent Grain Granola

Using spent grain for making homemade breakfast cereal will impress just about anyone.

Makes: ~½ gallon (~2 L)

Ingredients

1½ Cup dried spent grain, preferably a more pale grist
1½ Cup oats, rolled
1 Cup almonds, slivered, untoasted
1 Cup cashews, chopped, untoasted
2 Tb. flax seed, ground
2 Tb. chia seeds
2 Tb. hemp seeds
2 Tb. wheat germ
⅓ Cup honey, orange blossom or wild flower variety
2 Tb. malt syrup, such as Eden's Organic or liquid malt extract (LME)
¼ Cup oil, vegetable or unsalted butter
2 each oranges (or tangerines, tangelos, blood oranges), zested
1 Tb. coriander, ground
½ teaspoon salt, kosher
1 cup mango, dried and chopped finely

Step by Step

Preheat oven to 300 °F (150 °C), convection bake if you have the setting.

In a large bowl, add the dried spent grain, oats, almonds, cashews, flax seed, chia seed, hemp seeds and wheat germ. Mix well. In a medium sized sauce pan, over low heat, add the honey, malt syrup, vegetable oil, citrus zest (just the bright orange color, no white or pith as it is very bitter), coriander and salt. Heat the honey mixture to about 130 °F (54 °C), just to evenly incorporate all of the ingredients and distribute the flavor. Pour the honey mixture onto the grain mixture and fold to coat all the ingredients with a spatula. Transfer the cereal to a rimmed sheet tray lined with either a Silpat® or parchment paper and spread the mixture out to a thickness of about 1 inch (2.5 cm). Place in the oven and cook for approximately 45 minutes, stirring the granola and rotating the tray every 15 minutes to brown evenly. The finished granola will be soft when it first comes out of the oven. Stir in the dried mango, let cool and harden. Break up any lumps and transfer to an air-tight container and store for about two to three weeks, if it lasts that long. Serve with milk, yogurt or nut milk.

Spent Grain Baked Eggs

While the shell of an egg does not seem porous, it is very easy to flavor an egg by placing it in hops — or in this case, malt. The long contact time with steam from the cooking process gently cooks the egg and imparts a unique flavor and aroma of barley to the egg, infusing it with a new unexpected flavor.

Makes: 6 cooked eggs

Ingredients

2–3 lbs. (0.9-1.3 kg) wet spent grains, stout recipe grains preferred
6 each large eggs, room temperature
½ Cup water, 100 °F (38 °C)

Step by Step

Preheat oven to 300 °F (150 °C).

In a deep baking dish, cover the bottom with half of the wet spent grains. Arrange the eggs on top of the grain in a pattern to make them easier to find and cook evenly. Pour the remaining spent grains over the top and lightly pack the malt down to maximize the grain contact without breaking the

eggs. Add the water and place the dish in the oven. Bake the eggs for 2 to 2.5 hours, depending on desired egg style. For a softer egg with a slightly running yolk, cook about 2 hours. For a "hard cook" egg, similar to a hard-boiled egg, bake for about 2.5 hours.

Spent Grain Egg Uses

- Deviled eggs: Peel two whole eggs, cut in half lengthwise and remove the yolks to a bowl. Mash them with the back of a spoon and add 1 tablespoon of garlic aioli, 1 teaspoon malt vinegar, ½ teaspoon of hop salt (or a few pinches of thyme) and mix together. Fill the white "bowl" with the yolk filling and serve.
- Make an egg salad sandwich
- Make a mixed green salad with spent grain croutons and garnish with sliced malt baked eggs

Other Uses for Spent Grains

If you brew frequently and have lots of spent grains — more than your kitchen can accommodate — keep in mind that there are other uses for spent grain outside of cooking, baking and animal feed. If you like to grow mushrooms, spent grain makes a great substrate for growing edible spores. Also, when spent grain is mixed with large amounts of leafy material and left to decompose, it makes a wonderful compost for anyone who enjoys gardening.

Try experimenting with your spent grains to explore different flavors. Top, a banana is roasted with spent grains. Bottom, use your spent-grain baked eggs for deviled eggs.

(2.5 to 5 cm) and place it into a pre-heated oven set to 200 °F (93 °C). Place as many sheet trays as your oven can hold and let the grains dehydrate for six to eight hours (a perfect length of time to leave the pans in the oven overnight to dry). Using your fingers, break up any lumps and move the grains around to allow the grain to dry evenly. Once cooled, the dried spent grain can be transferred to air-tight Mason jars, flour/grain containers or zipper-style storage bags. Be sure to label your containers with the grist type and date for easy reference. For use in baking, pulse the dried spent grain in a food processor, blender, clean coffee grinder or flour mill and make spent grain flour. Again, transfer the grains to an air-tight container and label appropriately.

Now that you have fresh spent grain, wet spent grain, dried spent grain and spent grain flour in the pantry, what comes next?

Bed and Breakfast

There are so many ways to use the three forms of spent grains for breakfasts, breads and snacks. The key is to think about recipes that you already make with whole grains or flour and incorporate your spent grains in some way.

For example, spent grain flour has similar uses as regular flour. Cookies (biscotti, bars, oatmeal raisin, brownies, etc.), pie crust, pasta dough, muffins (savory to sweet, or even English muffins), scones, bread sticks, focaccia, pancakes, waffles, pizza crust, tortillas and even coatings for fish sticks and/or chicken fingers. The ideas and uses for spent grain flour are endless. You want to blend your spent grain flour with regular all-purpose or bread flour if you plan to use it for baking, however. Keep at least a ratio of spent grain flour to regular flour to no more than 50% of the combined flour mixture, as the amount of gluten in spent grain is low and you need the gluten to hold the baked goods together and give them structure.

ONE OF MY FAVORITE WAYS TO USE SPENT GRAIN IS FOR BAKING BREAD. INCORPORATING COOLED, FRESH SPENT GRAIN IN BREAD DOUGH ADDS TEXTURE, FIBER AND SOME FLAVOR TO THE FINAL LOAF.

One of my favorite ways to use fresh, spent grain is for baking bread. Incorporating cooled, fresh spent grain in bread dough adds texture, fiber and some flavor to the final loaf. However, the amount of flour needed in ratio of moisture to flour/grain will change each time depending upon the moisture content of the spent grain. This can challenge even the experienced baker and takes some practice. Design your brewer's bread around the type of grist that was used: how dark, roasty, malty, caramely, toffee is your spent grain? Were there any other malts in the brew, such as smoked malts, crystal malts, chocolate malt, wheat malt, rolled oats, rye, or other adjuncts in the grain bill that will change the finished flavor/texture of the bread being made? To further enhance those malt flavors, add a few tablespoons to ½-cup of the same unmashed malt you used in the beer that has been ground into flour, soaked in the hot tap water for 20 to 30 minutes to the bread recipe. You can use this mixture in place of sugar to activate the yeast. For more information about baking spent grain bread, visit http://byo.com/food-recipes/item/714-great-bread-from-spent-grains.

As for dried spent grains, the texture and fiber in dried spent grain are at the forefront in the creation of a dish. Granola is a good way to use it (see my recipe for Mango "Wit" Granola on page 61). Dried spent grain is also great

Many commercial breweries use their spent grains in creative ways, including making energy. Alaskan Brewing Co. in Juneau, Alaska recently installed a special boiler that uses spent grains to create steam heat. Above, spent grains at the Russian River Brewing Co. in Santa Rosa, California.

for incorporating into bread recipes (the moisture content is no longer an issue), cracker recipes, granola bars or exercise bars, and even biscuits. Biscuits can also be adapted into a cobbler or pot pie topping very easily. Try different proportions of your dried spent grain to get the texture/flavor just right in your favorite recipes.

Main Dishes

If you are looking for more substantial ways to use your spent grain, such as the main course, experiment using 50% wet spent grains with cooked garbanzo beans to make a middle eastern falafel, or create a new spent grain faux-hamburger patty mixed with other seeds, nuts, cooked beans, rolled grains, herbs and a binder such as eggs to hold together, and bake them off in a hot oven. Smoked malt will add extra umami to this type of creation. Another possibility is to add a few tablespoons of wet spent grain to a meatball recipe (beef, turkey, chicken

IT IS IMPORTANT, HOWEVER, TO BE THOUGHTFUL OF THE TYPE OF MALT THAT WENT INTO THE BREW RECIPE WHEN YOU CHOOSE A DISH, AS ALL THE PROPORTIONS OF THE BREW INGREDIENTS WILL CHANGE THE FLAVOR OF THE FINAL PRODUCT YOU MAKE WITH SPENT GRAINS.

or lamb), which will add a touch of texture and flavor.

Another use for this type of spent grain is as a cooking medium. Just as a layer of salt can be used to form a crust on fish or prime rib, protecting the protein or main ingredient from the heat of the oven, spent grain can be used in a similar manner. Using the spent grain to steam (remember all that residual water in the husk/kernel) a vegetable, fruit or protein will also impart flavor into the final product. Try roasting whole garlic heads, bananas, or even eggs in this form of spent grain. (See my recipe for baked eggs on page 61.)

It is important, however, to be thoughtful of the type of malt that went into the brew recipe when you choose a dish, as all the proportions of the brew ingredients will change the flavor of the final product you make with the spent grains. For example, the grains left over from brewing a Belgian blond (see page 20 of this issue for a recipe) might be a good match with a fruity granola mix, while grains from a malty southern English brown ale (recipe on page 54) might taste great if used to roast a few heads of garlic. BYO

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By Bob Machin

beer

I heard about a brewery in Germany that, once upon a time, acquired a good-sized meteorite, which they heated to red hot upon a rick of oak wood and then dropped into a kettle of waiting wort to achieve a very fast and outrageous boil. They used the meteorite over and over again and they called the brew steinbier. I liked the sound of steinbier and I thought I would try it.

Brewing at my Vermont home all takes place in the winter. Brewing on the homestead is just like living on the homestead: You grow your own, you make your own (when possible), you try to avoid buying stuff, you learn the conventional methods and then adapt them to suit your own conventions.

I read this magazine, I check out the recipes. I see the graphs. I ogle the equations and the mathematics and realize the science — all of this is very cool but . . . I don't do any of it — and you know what? I still make good beer. I mash in a 5-gallon (19-L) pot for 60 minutes, more or less, at 150 °F (66 °C) give or take; I sparge with 180 °F (82 °C) water to yield from 6 to 7 gallons (23 to 26 L). I boil in this same pot, aided by the almighty stein, for as long as it takes to get to 5 gallons (19 L). I divide the wort into two pots and set them into the snow to cool to 80 °F (26 °C) more or less. I pitch with Coopers ale yeast, pour the yeast through a strainer set in a funnel set in the carboy and then dump the liquor through, catching the hops. I let it ferment until it stops bubbling then I siphon the beer into a bucket holding ¾ cups of sugar; I siphon out of that bucket into bottles and cap.

I don't worry about exact mash temperatures or any other temperatures for that matter — ballpark numbers seem to work out fine. I don't try to match recipes and I don't use different specific yeasts. I don't aerate the wort anymore than splashing into the carboy. I don't do IBUs and Lovibonds. I don't measure out my hops and I don't bother with initial and final gravities. Now, don't get me wrong here. I think all these shenanigans are righteous and I love knowing and thinking about them. I just don't do them myself.

I buy 50 pounds (23 kg) of organic seed barley (usually 6-row), malt it myself in a series of batches in the house. The malting is done in a plastic bucket with a myriad of holes drilled in the bottom (the sparge is done in the same bucket). I then brew five batches of beer at 5 gallons (19 L) apiece, using approximately 10 pounds (4.5 kg) of malt per batch. Winter is the right time to brew for various reasons. First, the corner of the kitchen where the malting bucket sits rarely ventures above 60 °F (15 °C) and the rinse water from the spring is in the 30s °F(1 to 2 °C), so the malt stays clean and crisp and is never in danger of smelling damp or musty. Second, the woodstoves are always going and available for drying and roasting the malt. Base malt dries well on top of my bricked-up masonry oven and roasting can happen at varying temperatures inside the oven as it cools after the coals are raked out. Third, the snowdrifts outside are just the ticket for cooling the wort down. Please note: Making steinbier at home can be extremely dangerous — please see safety warnings on page 71 to prevent any harm to yourself or property.

“Brewing on the homestead is just like living on the homestead: You grow your own, you make your own (when possible), you try to avoid buying stuff, you learn the conventional methods and then adapt them to suit your own conventions.”

Caution: Making a steinbier is extremely dangerous, especially indoors. Rocks can (and do) explode when heated causing injury, and superheated rocks are extremely dangerous if not handled properly and can cause a fire and severe burns. Please see additional notes about steinbier safety on page 71. Do not attempt to brew beer in this manner indoors, or without proper safety precautions.

The "stein" in steinbier is the rock, and I had had enough experience with rocks in fire to know that they have a disturbing propensity to explode or break into pieces. Finding the right stone was critical and, lacking a handy meteorite, I contacted a friend in Oregon who mailed me a volcanic chunk from the slopes of Mt. Hood. You can see my stein in the photograph to the left, and though it appears to be pumice, it's actually quite dense and heavy.

My masonry oven is perfect for heating the stein, which takes anywhere from one to two hours to heat up. The temperature inside the oven becomes, unscientifically, very hot. The handheld infrared thermometer that I use maxes out at 999 °F (537 °C), so I surmise that the stein is well above 1,000 °F (538 °C). The temperature inside the oven comes down fairly quickly as the heat migrates to the outside masonry, so as I settle down for the 60- to 90-minute boil, I can throw a pizza in the oven and relax with one of last year's steinbrews.

The question you might ask is, "Why do this steinbier thing? It seems a bit over the top." That, of course, is the best reason for doing it. But besides the fun, why else? Well for one, it carries you into the boil instantly, and it's a hyperboil. Two, it caramelizes the sugars in the wort like nothing else (see sidebar on page 71). The flavor enhancement is especially good in darker beers like porters and sweeter stouts.

The last time I brewed, my Mt. Hood stone came out of the fire in two pieces. This was perhaps the tenth firing for this one, and it finally cracked. However, this is a case of, "The stein is dead, long live the stein." Another must be commissioned soon, and meanwhile I will scan the night sky longingly, especially during the Perseid meteor showers, willing one to come my way.

The first time I tried stein brewing, I set the kettle on the cookstove top, dropped in the stein, and we all watched agape as the liquor boiled over the pot, frazzled out across the hot steel and boiled down the sides of the cookstove onto the floor. It lead to much excitement and raucous commentary on the part of the peanut gallery. However, needless to say, I modified the plan after that.

Photos by Flying Squirrel/John Douglas

I would recommend using a much bigger pot to improve on my method, as mine goes literally — as well as figuratively — over the top (see photo, left). A bigger pot is more likely to contain the vigorous froth and foam at stein immersion. I just use what I've got. A truly bigger pot could contain a larger stone coming out of a bonfire, and would yield a boil of 20 to 30 minutes before needing a transfer to a stovetop.

All the hops I use for my beers are grown right here, which is easy to do in this climate. I use these same hops for bittering and aroma. I always use the same malt, the same hops, the same yeast. But does that mean that we have the same dreary beer to drink all year long? Not so. Each batch has its own character and no batch is ever to be duplicated. Put together 7 lbs. (3 kg) of base malt, 2 lbs. (0.9 kg) of wheat and 1 lb. (0.45 kg) of rice like I did only once for my father (since he thought beer should look and taste like Ballantine) and you get something so light you can read a newspaper through the glass. Roast 4 lbs. (1.8 kg) of crystal malt to a Lovibond off the chart and add to 6 lbs. (2.7 kg) of base malt and you get a bitter, stout-ish critter that my sister-in-law really likes.

Roast 10 lbs. (4.5 kg) of crystal to a medium color and add a couple of pounds to each successive batch while you vary the malt roast — lightly toasted with more hops and crystal, or darker roast with less hop and crystal, or 5 lbs. (2.3 kg) of base malt, 3 lbs. (1.4 kg) of dark roast and 2 lbs. (0.9 kg) of rolled oats. Put in more bittering hops, or put in no bittering and all aroma. Weigh once to see what an ounce of hops looks like and then just dump from the jar into the boil. The possible variety is, you see, virtually endless. However, none of these brews are necessarily pale ales or oatmeal stouts or any other recognizable style. They do get their names, of course, everything from Dad's Brew, to Big Muddy, to Flying Squirrel (the batch I brewed in the photos you see in this story).

Steinbier Safety

Please note: Making a steinbier at home is dangerous. If you are considering trying to brew your own steinbier, you must make safety your first priority. Keep these two considerations in mind:

1. Fire = bad. An open fire is dangerous, so be sure that your heat source is contained and that you have a fire extinguisher nearby. Use protective eyewear, insulated and flame-resistant gloves and a flame-resistant welding apron at all times.

2. Superheated rocks can burn you and/or explode. "Stein" rocks are extremely hot and need to be handled and transferred with care. Be sure to use long, well-insulated welding tongs for transferring the rock from the fire to the brewpot. Rocks also must be chosen carefully. Granite is the best choice for homebrewers as any moisture trapped in the rock will become superheated and can cause the rock to explode.

What is Steinbier?

The word "steinbier" means "stone beer" in German. The name originates from a technique of boiling wort in the brew kettle by dropping super-heated stones into the kettle. In the old days, many brew kettles were made of wood and obviously could not be direct-fired. The hot-stone method, therefore, was the only way the wort could be brought to a boil. Beer boiled this way also tasted different from "normal" beer, because the rocks, when dropped into the brew, scorched and caramelized some of the malt sugars. The result was a smoky-tasting deposit that literally sugar-coated the rocks. Once the beer was strained from the brew kettle into the fermenter and had cooled down, the coated rocks were removed from the kettle, too, and dropped into the fermenting beer. There, the yeast made short shrift of the sugar coating. The result was a beer with a pleasantly smoky flavor and a slightly sweet, malt-candy-like finish.

(From http://www.germanbeer institute.com, Horst Dornbusch)

Adjusting for Filtering

Designing recipes for flavor

by Terry Foster

"Gravity settling good, filtration bad," was my conviction for a long while. I joined England's Campaign for Real Ale (CAMRA) in its early days and am still a member, even though I no longer subscribe to its doctrinaire approach. For CAMRA considers that filtered beer is not "real ale," because it says that real ale must undergo conditioning through fermentation in its final vessel, that is to say in cask or bottle. If it is chilled and filtered as so many commercial beers are, then it cannot be called real ale. What this implies is that filtration detracts from beer flavor, and, in the context of English commercial brewing in the 1970s and 1980s, chilled and filtered beers were in fact inferior to "naturally conditioned" ales.

But since those days I have tasted many good craft beers that were filtered and I have come to the conclusion that if the recipe is designed on the basis that the beer will be filtered then the end result will be a good, well-flavored beer.

Commercial brewers use filtration to remove the yeast and to give a beer with brilliant clarity, because we do have the bad habit of drinking with our eyes. Of course, *BYO* readers are more sophisticated than casual drinkers and will carefully consider the flavor, but I can assure you that your perception of flavor will still be influenced by the clarity of the beer to some extent. Many commercial brewers also filter beer, after a period of chilling, in order to remove as much as possible of those materials that result in chill hazes. These are hazes, broadly based on protein/tannin complexes, which form when the beer is cooled from ambient temperature by means of refrigeration. In other words, filtration confers storage stability on the beer. Many craft brewers are less bothered about that because they are often making highly-hopped beers which will throw a chill haze. These brewers do, however, like to filter out the yeast for two reasons, the first being that significant amounts of yeast will give the beer an unpleasant bitter flavor. The second reason for filtering is that getting rid of yeast in the final container means that the beer will be stable to further fermentation. That is particularly important where the beer has been brewed to give a relatively high finishing gravity so that it is a full-bodied drink. I have come across quite a number of beers where a bottle-conditioned version tastes thinner than its draught counterpart because those residual sugars had been fermented out in the bottle.

So now my conviction is, "filtration good, doctrine bad." Of course, many homebrewers do not filter their beers and use gravity clarification quite happily and successfully. But others like the idea of producing something as bright as any commercial beer, particularly if they want their beer to look its best when it appears before the judges in a competition. That brings me back to what I mentioned earlier and the idea that if you are going to filter, then the beer should be designed in such a way that after filtration it tastes exactly how you want it to taste.

For CAMRA was right in one sense: filtration does remove more than just yeast and chill hazes. It varies according to the efficiency of the filter medium, but filtration can remove color, flavor and head retention of the beer. The standard filters used by homebrewers (and many craft brewers) are called depth filters and are capable of removing particles smaller than the quoted pore size. In other words, a filter rated at 5 microns, about the size of a yeast cell, can remove much smaller molecules, particularly if they are charged, such as proteins and protein degradation products. Some of the latter cause chill hazes as I have said, but others are surface active and help the beer to form and retain a head when poured.

"... If the recipe is designed on the basis that the beer will be filtered then the end result will be a good, well-flavored beer."

Photo by Charles A. Parker/Images Plus

There are filter pads available through homebrew suppliers with pore sizes even lower, at around 1 micron, and even 0.5 microns, the latter being "tight" enough to remove even bacteria. For more on the specifics of setting up a home filtration system see Dave Miller's recent article in the December 2012 issue of *BYO*.

What I have not seen much information of in the literature is the fact that filtration will take out much of the hop character in the beer. We run a 5-micron sheet filter at BrüRm@BAR (in New Haven, Connecticut) and it is an education to taste the beer before and after filtration. In particular our pale ale, which is heavily dry-hopped in the fermenter, has much more hop character before filtration than after. We could, of course, serve it unfiltered but we do not want to do that for our customers are used to this beer appearing bright. And note that this is a relatively coarse filtration designed to take out mainly yeast and other large particles, such as residual hops. If we used, say, 1-micron filter sheets we would probably remove even more of that lovely hop character.

What are the main problems?

The two effects that homebrewers need to worry about most are loss of mouthfeel (for which proteinaceous materials are at least partly responsible), and loss of hop character and aroma. I would venture to suggest that since these are precisely the aspects of beer flavor that craft and homebrewers want to have more of than you can get in a "standard" commercial beer, then this is a relatively serious downside to filtration.

Solving the problems

The simple answer to reduced mouthfeel, or body, is to increase the amount of malt compared to what you would use for a similar but unfiltered beer. But of course such a remedy is too simple. If you just increase the overall amount of malt you will also increase the original gravity of the beer and its alcohol content. And if it contains highly-roasted malt a simple percentage increase in these can seriously affect the balance of the beer. For example, if you were aiming at brewing a full-bodied stout containing some black malt, and increased the amount of black malt to compensate for filtration, you can very easily make the beer harsh and one-dimensional, and finish up with something like Guinness Extra Stout. In that instance add 10–15% more black malt, but use only the debittered type.

The trick is to increase only those malts which will significantly affect mouthfeel without adding unwanted flavor characteristics. That means opting for one of the many varieties of crystal/caramel malt that are available. For 5 gallons (19 L), try adding around ½ lb. (0.25 kg) of such malt in the mash, or steeping it if you are using malt extract.

This is in addition to any crystal/caramel malt in the original recipe. This means that you are adding about 4 extra gravity points to the beer, which may or may not be significant depending upon the type of beer being brewed. If you think this takes the wort to too high an OG, decrease the amount of pale malt or base malt extract correspondingly.

The choice of which crystal/caramel malt is also up to you, and will vary with the beer style you are making. This is mainly a question of color, as you would not want to add something like Special B or 120 °L English crystal to a pale ale recipe, whereas either might go well in, say, an American brown ale. What you need to do is to think carefully about the style, and then select the "extra" malt so as it will fit in with that style. If you are not sure about the properties of caramel malts check with your retailer, or look at their online catalogues.

Another variation on this technique is to substitute pale malt with some special base malt, such as Munich (again watch the color as it comes in different varieties) or Vienna malt. Check out such malts as I mentioned earlier and don't hesitate to be creative. A variation you might also want to try with an all-grain beer is simply to increase the mash temperature, say from 150–152 °F (65–67 °C) to 154–156 °F (68–69 °C), in order to increase the amount of dextrin in the beer, which will add to mouthfeel.

Lastly, what about hops? Again this is going to depend very much on the beer to be brewed, but I wouldn't increase the bittering hops. Overdo the bittering and it will stand out if your filter reduces the mouthfeel of the beer. You do want to increase the amount of late additions for aroma and flavor, however — probably by around 20–50%. And for dry hops added in the secondary fermenter I would go even higher — up to 50%, or even 100% more in an IPA and its variants such as double IPA, black IPA, American stout and so on. This is going to depend on the hop characteristics, and you might even want to change the hop variety for one with a higher level of essential oils. Be careful if you do this latter as you might change the hop character entirely, so you must use hops which will give a similar character. For example Centennial is sometimes known as "Super Cascade," and is quoted as containing 1.5-2.3% oil. This variety could therefore be used in place of Cascade, quoted at 0.8-1.5% oil, without changing the overall hop character of the beer. (I don't have space to go into this in any more detail since this is a complicated subject unless you have access to good information and/or a lot of experience with different hops.)

I can't go into too much detail here on these changes, so I am accompanying this article with a couple of recipes, which you can find on the next page, which exemplify the changes. For simplicity I have chosen a pale ale and a stout so that they have a relatively simple malt or extract bill.

Unfiltered vs. Filtered Recipe Adjustments

Perfect Pale Ale
(5 gallons/19 L, all-grain)
OG = 1.057 (14.2 °P) FG 1.014 = (3.6 °P)
IBU = 42 SRM = 16 ABV = 5.5%

Ingredients

a) Unfiltered	b) Filtered
10 lb. (4.5 kg) 2-row pale malt	9.6 lb. (4.35 kg)
1 lb. (0.45 kg) Crystal malt 55 °L	1 lb. (0.45 kg) Crystal malt 40 °L
10.4 AAU Centennial hops (90 min.) (1 oz./28g at 10.4% alpha acids)	1 oz. (28g)
1 oz. (28g) Mt. Hood hops (0 min.)	1 oz. (28 g)
1 oz. (28g) Crystal hops (dry-hop)	1.5 oz. (42 g)
1 oz. (28g) US Goldings hops (dry-hop)	1.5 oz. (42 g)
White Labs WLP001 (California Ale) yeast	

Step by Step

The brewing process is identical for both versions of this beer. Mash in the grains with 3.75 gallons (14 L) of water to reach 151–153 °F (66–67 °C) and hold for 60 to 90 minutes. Run off and sparge with hot liquor to collect 5.5–6.0 gallons (21–23 L) of wort. Boil 70 minutes, adding hops as listed above. Run off and cool to around 68 °F (20 °C), then pitch with yeast, preferably as a 1–2 qt. starter. After five to seven days rack to secondary, add Crystal and Goldings hops in a muslin bag and leave for at least two weeks before racking.

Beer a) can then be bottled or kegged, while beer b) will be racked to a keg and filtered, when it can be kegged or bottled.

Not Too Dry Stout
(5 gallons/19 L, extract with grains)
OG = 1.040 (9.8 °P) FG 1.010 = (2.6 °P)
IBU = 30 SRM = 51 ABV = 3.8%

Ingredients

a) Unfiltered	b) Filtered
4 lb. (1.8 kg) Amber malt syrup	4 lb. (4.35 kg)
0.8 lb. (0.36 kg) Amber DME	0.6 lb. (0.27 kg)
0.8 lb. (0.36 kg) Belgian special B malt	0.5 lb. (0.227 kg)
0.75 lb. (0.34 kg) dehusked black malt	0.75 lb.(0.34 kg)
8.1 AAU US Goldings hops (60 min.) (1.8 oz./51 g at 4.5% alpha acids)	1.8 oz. (51 g)
1 oz. (28 g) Liberty hops (0 min.)	2 oz. (56 g)
Wyeast 1084 (Irish Ale) yeast	

Step by Step

Steep the grains (in a muslin bag) in 2 qts. (2 L) water at 150–160 °F (65–71 °C) for 20 to 30 minutes. Remove the bag and rinse with 2 qts. (2 L) hot water. Transfer the liquid to the boiler. Carefully dissolve the malt extracts in the wort and top up to 5 gallons (19 L) of water. Bring to a boil, add hops as listed above. Siphon wort from the trub and cool to around 68 °F (20 °C), then pitch with yeast, preferably as a 1–2 qt. starter. Ferment five to seven days, and rack to secondary for a further seven days. Beer a) can be bottled or kegged immediately, while beer b) is filtered before kegging or bottling. BYO

O_2 and Plastic

Oxygen transmission rate through polymer

by Chris Bible

The material of construction of the fermentation and conditioning vessels is an important consideration when brewing beer. Homebrewers have had many discussions and debates regarding the relative merits and problems associated with the use of plastic vs. glass or stainless-steel fermenters and conditioning vessels. One of the perceived disadvantages with using plastic fermenters is that plastic fermenters are permeable to oxygen. Since plastic is permeable to oxygen, the oxygen in the atmosphere can diffuse through the walls of the plastic fermenter and into the wort and/or finished beer.

Oxygen is the enemy of beer. The majority of the flavor and aroma changes that develop as beer ages are the result of oxidation. Molecules of the various flavor compounds and alcohols within beer undergo a chemical combination with oxygen to form the flavor and aroma molecules that are responsible for the tastes commonly associated with "stale" beer. Compounds such as fusel alcohols, acetaldehyde and trans-2-nonenal are the molecules that are primarily responsible for the majority of the off-flavors associated with stale (oxidized) beer. Oxidation impacts the flavor and aroma of beer in a way that depends on many details that are specific to the particular type of beer in question. If trans-2-nonenal is formed in a lighter, less robust beer, it may cause a lipstick-like or papery flavor to develop within the beer. Trans-2-nonenal (an aldehyde compound generated by the oxidation of linoleic acid) has a flavor threshold of approximately 0.1 ppb, so even very small amounts of this compound in a beer will likely be noticeable.

The degree to which atmospheric oxygen will penetrate a plastic fermenter or conditioning vessel is directly related to the oxygen transmission rate (OTR) of the specific plastic from which the vessel is constructed (see the chart on page 78).

Oxygen transmission rate

The rate of oxygen transport through a polymer (plastic) barrier is described by the overall oxygen transmission rate for the polymer. Vessels constructed from high-density polyethylene (HDPE) or other oxygen-permeable materials should be limited to less than 60 days, or avoided altogether. Additionally, it is very important to avoid opening a sealed fermenter during the fermentation or conditioning process. While it is certainly true that there are many successful professional and homebreweries that use open fermenters and make great beer, the act of opening a sealed fermenter will effectively "stir up" the gases in the headspace above the liquid in the vessel and cause oxygenated air to mix in with any blanket of CO_2 gas that may be present.

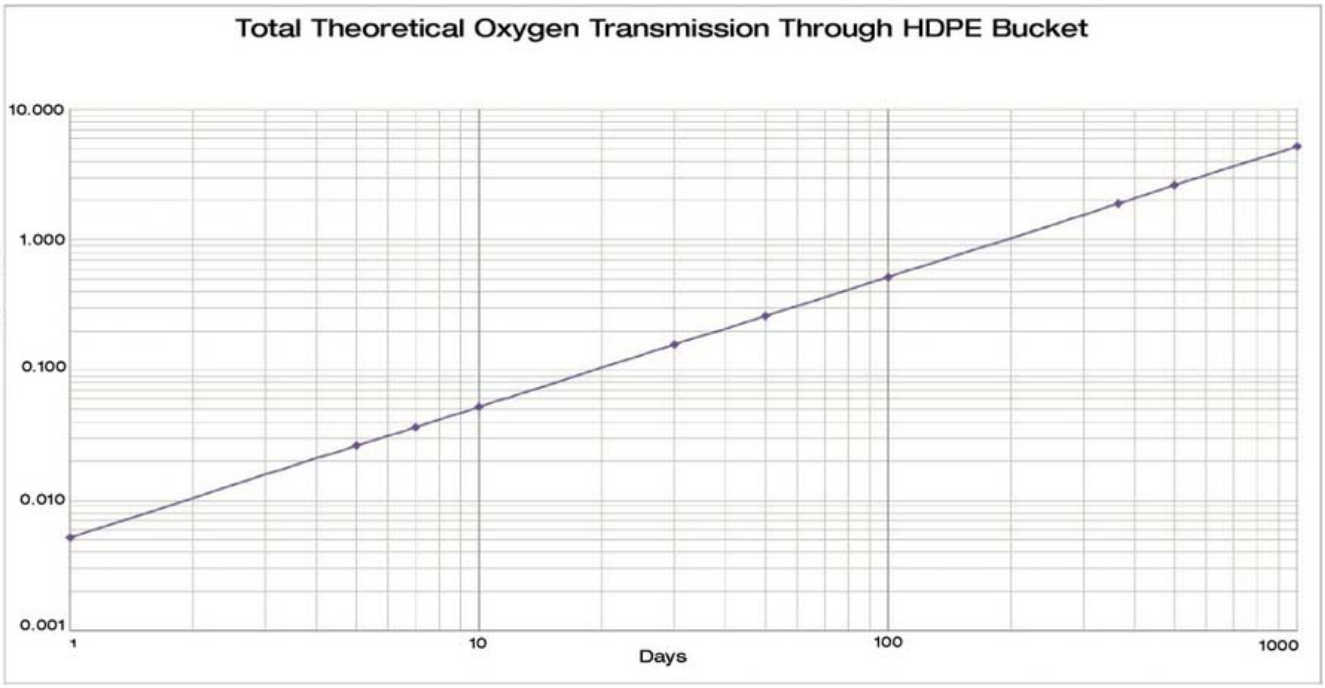
As I said before, oxygen is the enemy of beer. Be diligent and do everything you can in your homebrewery to prevent contact between oxygen and your finished beer and you will be rewarded with better, longer-lasting beer.

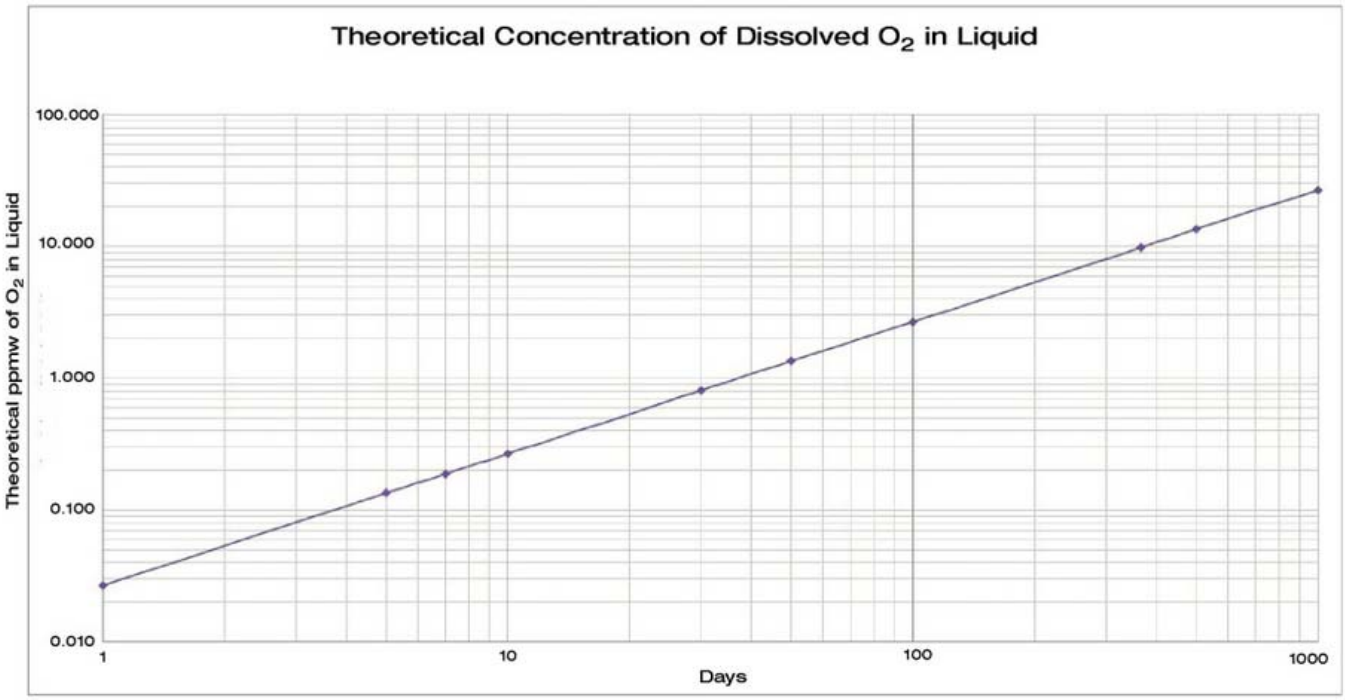
> "Compounds such as fusel alcohols, acetaldehyde and trans-2-nonenal are the molecules that are primarily responsible for the majority of the off-flavors associated with stale (oxidized) beer."

Table 1: Taste Threshold for Some Oxidation-Derived Compounds in Beer

Oxidation-Derived Compound	Taste Threshold in Beer
Trans-2-nonenal	0.1 ppb
2,3-pentanedione	1.0 ppm
Acetaldehyde	2-3 ppm
Benzaldehyde	1.0 ppm

Photo by Les Jörgensen





Jacketed Mash Mixer

Build a better mash tun

by Walter Diaz

I believe a gentle mixing process helps loosen starch particles from grains making them more available to hydrolyzing enzyme action. In spite of clear evidence from commercial practice where mash mixers are used, there are certain problems I have found frequently associated in homebrewing literature with a stirred mash. Most often these problems relate to destruction of grain husks due to excessive mixing, mash hot side aeration (oxidation) and scorching of grains when the mash is heated by direct flame. However, all of these problems can be easily avoided.

To prevent scorching of grains it is important to add heat to the system in a controlled manner. The best way to do this is by applying heat indirectly, over a large surface. One way to do this is with an external electric heating jacket. In electric heaters, watts per square inch (WPSI) provides a measure of how gentle heat is applied to the system. In the world of electric heaters as used in RIMS systems anything around 50 WPSI qualifies as ultra low watt density (ULWD). Using a heating jacket, watt densities of 10 WPSI or less are available.

Problems regarding the destruction of grain husk and hot side aeration are directly related to the type of impeller/paddle used, impeller RPM and its location in the mash vessel. In terms of mash mixing, good performance means circulating the mash throughout the vessel fast enough to prevent stratification of temperatures but not aggressively as to cause splashing of wort and damage to grain husks. To achieve this, the mixer impeller needs to be located near the bottom of the mash tun, slightly off the center, and the blades need to be at least slightly pitched to force top to bottom circulation. An impeller speed less than 60 RPM is ideal.

This project is an electrically heated jacketed mash mixer tun incorporating some of the ideas mentioned earlier. For its use, the process starts by heating the strike water by direct flame at the bottom of the mash mixer tun. This mash mixer tun is a stainless steel pot retrofitted with a false bottom-dip tube assembly and a mechanical mixer in it. When water has reached the desired strike temperature, the propane burner is turned OFF and the mash mixer is turned ON (the mash mixer stays ON during the whole length of the mash process). The grains are added to the mash mixer where they are automatically blended and heated by an electric heating jacket. This heating jacket wraps the outside walls of the mash mixer tun and is turned on/off as necessary by a PID temperature controller to maintain constant temperature within 1 degree Fahrenheit (0.5 °C) or less.

Tools & Materials

- (1) 8-gallon (30-L) stainless steel stock pot
- (1)12VDC gear motor (from a truck windshield wiper system)
- (1) PID Controller model E5CN Omron
- (1) Electric heating jacket model WAD561001 from BriskHeat
- (2) ¾-inch stainless steel street elbows
- (1) ¾-inch x close stainless steel nipple
- (1) Stainless steel false bottom
- (1) Weldless valve
- (1) Aluminum square tube and angle
- (1) 14-gauge aluminum sheet metal
- (1) On/off switch
- (1) Fuse holder with 3-amp fuse
- (1) Plastic box
- (1) 12VDC Power supply with 6-amp rating

> "To prevent scorching of grains it is important to add heat to the system in a controlled manner. The best way to do this is by applying heat indirectly, over a large surface."

1. INSTALL THE LAUTERING PARTS

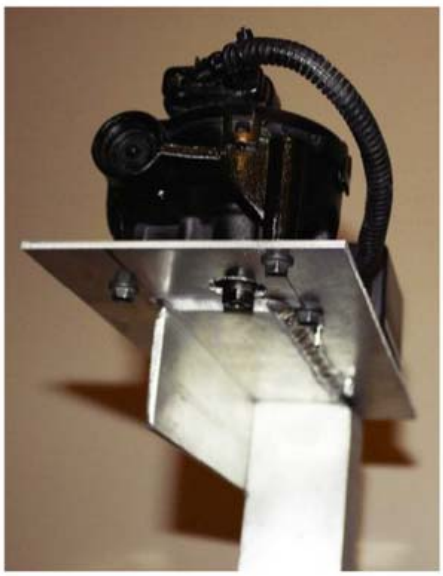
Install drain valve, false bottom and dip tube to allow for lautering in mash mixing vessel.

Drill a ½-inch hole approximately 1.25 inches (3.1 cm) from the bottom of the stockpot. Install the weldless valve and lay the false bottom inside of the mash tun. Thread the street elbows into the valve inside of the mash tun as shown in picture. Mark the approximate location on false bottom and drill a hole in the false bottom for the male threaded side of the second elbow to go through the false bottom. This will serve as dip tube in the lautering step.

2. WIRE THE HEATING JACKET

Attach the heating jacket by holding its ends together with the provided spring. Connect the heating jacket to the PID controller. Note that we are using the same wiring diagram for the PID controller as the "Build Your Own Mash Tun" article from the January-February 2013 issue of *Brew Your Own* (http://byo.com/story2799). The only change is that the controlling load is a heating jacket instead of a pump.

I used a 120-volt 1.1kw heater with a 6 WPSI heating density. In a 5-gallon (19-L) mash, a temperature gain around 0.6 Fahrenheit (0.3 °C)/minute can be expected. If a step mash schedule is being used and the temperature difference in the mash steps is large (more than 10 °F/5.5 °C), the mash volume is more than 5 gallons (19 L), or a short ramp up time is desired, the propane heater at the bottom may be used to assist in temperature ramp. The false bottom and mash mixer prevents the grains from being in contact with the directly heated bottom, thus preventing any scorching of grain). Once the temperature is near 2 °F (1 °C) from set point, the propane burner is turned off and temperature control returns to being a PID controller and heating jacket.

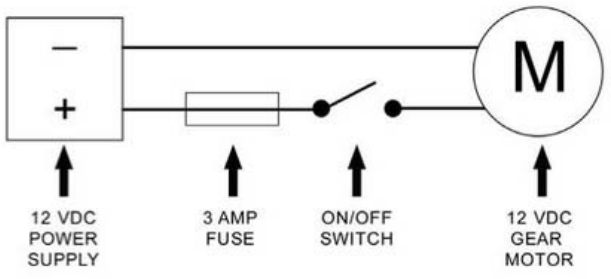


3. BUILD THE STAND

Mount the gear motor on the platform. Measure the mash tun height and add at least 3 inches (8 cm) to this dimension and this will be the height of the mash mixer stand. Measure the mash tun diameter and multiply that measurement by 1.5 for the mash mixer extension. The sheet metal is placed on top of this extension and the electric mixer motor is bolted on to it. Weld the structure together (or bring to a machining shop or welder to weld it together).

4. BUILD THE POWER SUPPLY ENCLOSER

The purpose of the power supply enclosure is to make the electrical connections for the on/off switch and fuse (for overload protection). The wiring of this is simple. There will be only two wires to work with. One wire from the DC motor runs in series through the switch and fuse, while the other goes directly to the power supply. Switching the wires from positive to negative or vice versa reverses the motor rotation. The plastic box, on/off switch, fuse holder and 12VDC power supply can be found at specialized electronic supply stores. Do not attempt to perform any electrical wiring if you are not trained. Find an electrician to help you.



5. BUILD THE IMPELLER

The paddle used in this project was built from stainless steel sheet metal and a ¼-inch stainless steel rod for the impeller shaft. At the top of the paddle shaft I welded a square piece of metal to serve as attachment to the motor shaft. I drilled a ¼-inch hole for a bolt to go through it on top and screw into the motor shaft. The blades are angled at approximately 45 degrees overall and each blade was built from a 4-inch x 5-inch (10-cm x 13-cm) stainless sheet metal bent and welded as shown in picture.

6. SCREW IMPELLER TO THE GEAR MOTOR

Below the gear motor shaft, underneath the sheet metal supporting the gear motor, the bolt used to take the mixers shaft on/off can be seen. Assuming all went well, plug your new mash mixer into a GFCI outlet and give it a test run! BYO

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All Bark, No Bite

Dog rescues and root beer

Diane Rose-Solomon • Los Angeles, California

Five years ago Oscar Youd decided, with the help of his family, to study how yeast eats sugar to create carbonation. Oscar was in kindergarten at the time, and the project was for his school science fair in Los Angeles. Oscar's dad, Tim had experience making root beer as a kid with his grandfather, so they used a kit they purchased and doctored it up with a few extra ingredients from their old family recipe to make it even tastier.

A few kitchen explosions here, a giant mess there and the Youds bottled 120 bottles of their root beer, which they served to more than 300 people at the fair. It was so well received that all of Oscar's friends and family thought that the family should sell it, which is exactly what they did.

But there's a sweet twist. It turns out that the Youd family, in addition to making delicious root beer, is a bunch of animal lovers . . . rescued animals in particular. After the science fair and the overwhelmingly positive reaction from friends and family, Tim turned to Oscar's mom, Jessica, and said, "Let's manufacture this and give 100% of our profits to animal rescue." Thus the story of Margo's Bark began.

> "Tim turned to Oscar's mom, Jessica, and said 'Let's manufacture this and give 100% of our profits to animal rescue."

Photo Courtesy of Margo's Bark

The Youd family soon discovered that making root beer takes more than just good quality ingredients and a little carbonation. They bought and tasted just about every brand of root beer that is made in the US today to hone in on exactly what makes a root beer great. They also worked for more than a year to get the taste just right. Every month the whole family sat around the kitchen table offering tasting notes on a new round of root beer samples. The following month, more sample recipes would get tasted. According to Jessica, President of Margo's Bark, "Patience, knowing exactly what taste you are looking for and the best ingredients you can find" are what make the best product.

Once they settled on a final recipe, the Youds toured bottling plants and microbreweries to study the production process and applied what they learned to Margo's Bark. The packaging design is based on Oscar's original artwork. The whole family continued to play a part in the distribution as Oscar's older siblings — the ones old enough to drive — helped with local deliveries as well as serving Margo's Bark at animal rescue events. As a result of the good taste, natural ingredients and the cause, Whole Foods, became interested in the product on the West Coast and it has been growing ever since.

Why the name Margo's Bark? Margo is their rescued black labrador retriever/pit bull mix and Oscar named the root beer after her. It is truly a smooth root beer — "All Bark and No Bite," you might say.

All of the proceeds from Margo's Bark are donated to animal rescue organizations. The Youds have met many rescue organizations and donate to those most in need, for example local Southern California rescues in need of medical funds or funds for fostering pets. They also help a wild burro rescue and farm animals.

Oscar's favorite treat is a root beer float. So just as long as there is some ice cream around to pour the root beer on top of, he's thrilled. Of course every time the Youds are invited to a party, they come with Margo's Bark, which is always welcome.

Margo's Bark root beer is found in prominent retailers and restaurants on the West Coast and can be ordered online as well. Check out their website for more information about their root beer, which features an online store as well as a listing of the animal rescue groups that receive assistance from the sales of Margo's Bark. http://www.margosbark.com/ BYO

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