

Brew

FEBRUARY 2000, VOL.6, NO.2

THE HOW-TO HOMEBREW BEER MAGAZINE

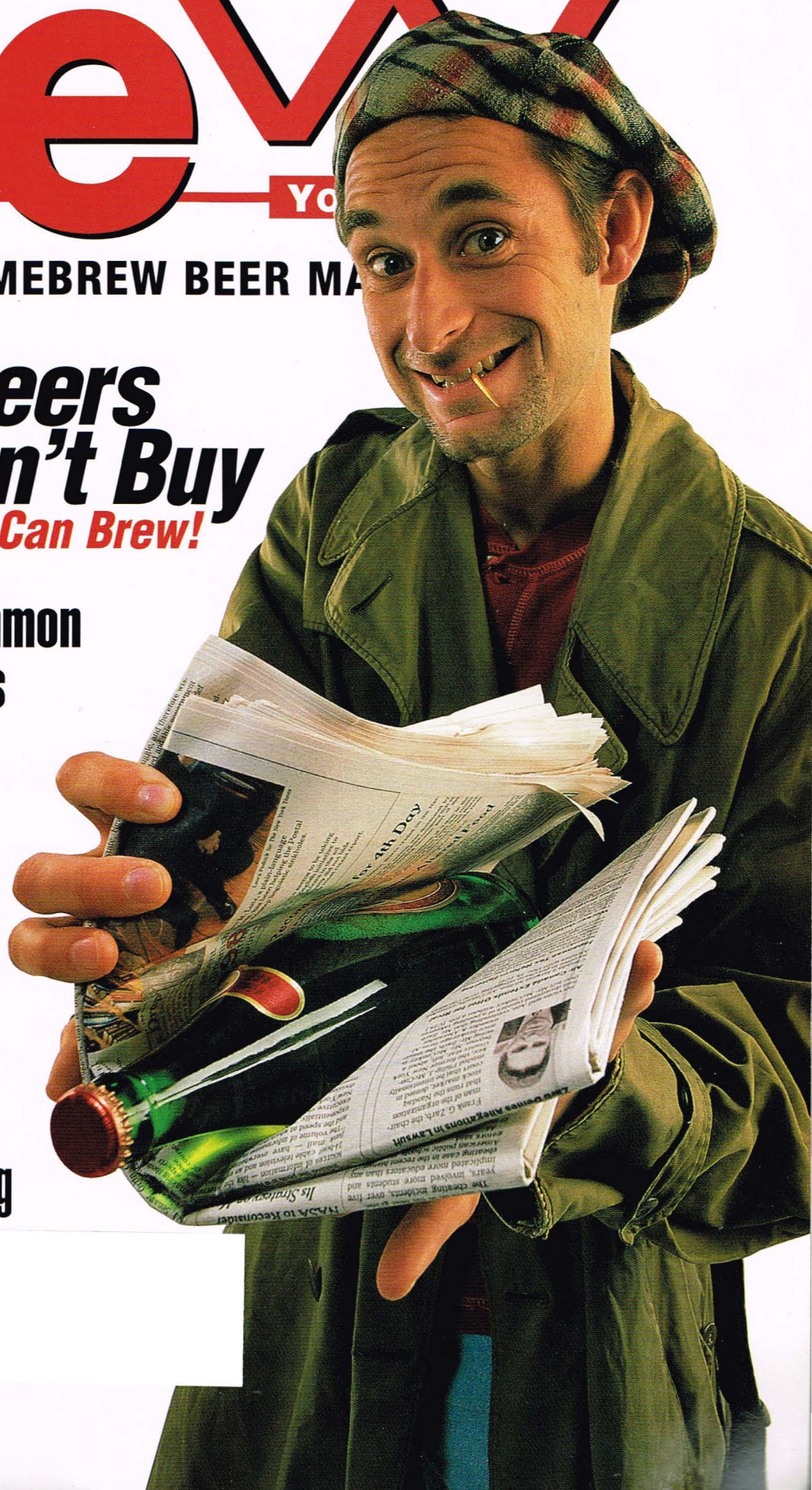
4 Great Beers You Can't Buy *But Now You Can Brew!*

**Don't Do It! 8 Common
Brewing Mistakes**

**Styles: Irish Stout,
Cream Ale**

**Take Control of
Beer Color**

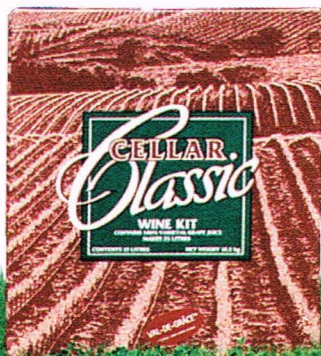
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Some Spacey Thinking

Maybe you read about this recently: Some guy has locked himself in his house with his computer and a super-fast Internet connection. He says he won't come out for a year. Everything he needs he'll order online.

Welcome to the 21st century.

Sure, you say. What's the big deal? There are already plenty of teen-agers doing exactly the same thing — give or take a few hours a day for school. And they just stay in their bedrooms.

Of course this guy could stay in his house for a year and order everything by telephone, too, but where's the fun in that? Well, maybe if it were a cell phone...

I bring this up because I've been feeling bad lately for some other technology mavens, the hard-working people at NASA. Here we are in the year 2000. The Future that we read about in books and saw in movies and TV shows has, numerically at least, arrived. And there's no question that we are enjoying lots of technological advances. Super-fast computers, the Hubble telescope. Let's see, what else?

Well, there's virtual golf — put on a set of headphones, look at the screen, and grab your driver. You can travel to St. Andrews, Scotland, without having to try to understand those funny accents or eat sheep intestines for dinner. And for the kids, Baby Furby. Learn firsthand why Mom and Dad spent the first 18 months of your life wondering what they had gotten themselves into.

These are nice, but technology in the 21st century is supposed to mean space travel. Shouldn't we already have a colony on Mars and be getting ready to explore new galaxies? Next year is 2001. Where's the space odyssey?

Anyway, I think I know what went wrong with the Mars mission.

NASA sent the Orbiter, the Lander, and two special rocket/hole digger thingees to Mars in search of signs of life. All four of these highly engineered machines disappeared.

There's a respected theory that says the simplest answer to a problem is usually the one that's true. Is there life on Mars? Four spacecrafts are missing. Question answered. You think someone on another planet wants to be visited by a government agency? Hey, those things just say USA on the outside. How does some Martian know it's not the IRS probing for new revenue sources?

In this month's issue we do a little exploring of our own. The idea for our cover feature came about one day when we were chatting about a real advance for society in the new millennium: all the great beers you can get in bars and stores now compared with 10 years ago. Now there's something that makes life better! But then we started thinking about all the great beers you can't get in the United States. Of course, we immediately wanted them.

"Four Great Beers You Can't Buy — But Now You Can Brew" looks at a handful of truly excellent beers, from a terrific British brown to a delicious French Abbey ale, that aren't available in the United States. Be the first person in your neighborhood to taste these great brews without all those pesky travel arrangements. The story, recipes included, begins on page 28.

Hey, it beats virtual golf any day.

Craig Bystrynski

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Professional Keg Advice

Dear Brew Your Own,

I just read "Big Brewing for Risky Times: Prepare Now for Y2K" (December '99 BYO). I

make my living working with stainless steel beer kegs, so I must point out some questionable information.

The 17-gallon keg mentioned in the article would have to be special ordered. The largest keg made for normal distribution is 15.5 gallons.

Most important, I must take exception to the advice to "scour the inside...with soap and steel wool, to remove welding residue and any old beer stains." I strongly urge readers to avoid following that advice. Using steel wool will contaminate the stainless steel with carbon steel deposits and result in severe rusting. *Never* use any standard steel wool (or steel brushes, tools, and so forth) on stainless steel. Instead use cloth or fiber scratch pads if professional acid passivation is not available. This also goes for the drill bit as well. It should be a stainless bit and, even then, the area around the drilled hole should be treated as a weld.

Proper treatment of a stainless weld calls for acid passivation of the weld to remove weld stain and contaminants. This process also raises nickel to the surface, and this is what makes stainless steel easy to clean and sanitize and what keeps rust from forming.

*Rick Henzler
Sabco Industries*

Party On

Dear BYO,

I just finished reading "A Delicious Way to Celebrate." What a great article! What better way to spend New Year's Eve than with family, friends, good food, and wonderful homebrew. All the recipes for both the food and beer sound absolutely wonderful. Has the author written any cookbooks or homebrew books?

*Lloyd Giardino
via e-mail*



*Tess Szamatulski
and her husband,
Mark, wrote*

*Clonebrews: Homebrew
Recipes for 150 Commercial
Beers (Storey Books).*

Importance of Efficiency

Dear BYO,

I enjoy your magazine and have a suggestion: List the assumed efficiency for your all-grain recipes. I brewed your Christmas Ale recipe (Style of the Month, December '99 BYO) and ended up with about 10 gravity points less than the listed OG. I know I should have checked your recipe against my own system's efficiency.

*Henry Raynor
via e-mail*

We check all of the recipes submitted in an effort to prevent problems like the one you had. We assume between 65 percent and 70 percent yield from malt, depending on the recipe. Checking our assumptions against your actual system is certainly a good brewing practice. Thanks for the suggestion.

Bottle Quest

Dear BYO,

In "Take Heart with Winter Warmers" (November '99 BYO) you suggest eight-ounce bottles for single servings. I've been looking for smaller bottles for some time with no luck. I would appreciate any help you could lend in finding a source for eight-ounce mini beer bottles.

*Mark H. Lester
Enid, Okla.*

Some large breweries still use returnable, long-neck seven-ounce bottles. Call a beer distributor for availability. Distributors occasionally sell returnable glass. Another option is to check with a soda bottler and get some of the clear, eight-ounce soda bottles. If you use these, store your beer in a dark place.

Functionally Fashionable

Bruce King
Wauseon, Ohio

A brewday uniform should be as important as the brewing equipment and ingredients you use. For me it all boils down to the shoes. But from there on up, being functionally fashionable is just as important.

I've been brewing for about two years and learned early that the shoes you wear make a world of difference. If I'm not standing at the brew pot, I'm standing somewhere else doing something toward ensuring that perfect batch. There's no sitting down on the job come brewday! My good old trusted Nike cross-trainers have served me well. Just the support I need, where I need it, when I need it.

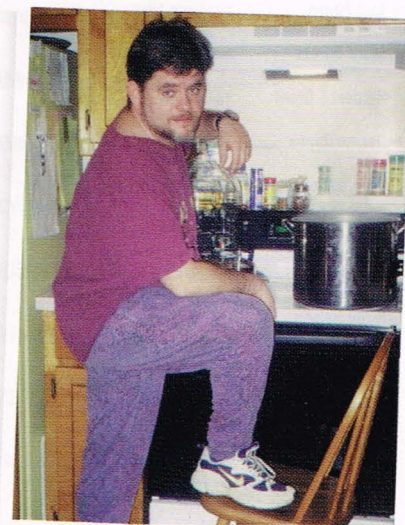
Pants can't be restrictive, whether they're jeans, shorts, or bib-overalls. Once the boil is completed, and even before then, you have to bend, twist, lift, and sometimes drop to your knees and pray. The brewer's range of motion

should not be restricted by attire that is snug in places where roominess is needed. I prefer my flexible yet fashionable sweat pants. I have a specific pair that I wear just because I like the color scheme: a collage of purple, red, blue, and black splotches.

My shirt must be roomy as well. T-shirts are sufficient and can be easily matched to my sweat pants or hospital scrubs, whichever the case may be.

Topping off any uniform should be something to prevent hair from falling into your wort. For me it's my favorite "No Fear" baseball cap, reflective of my brewing attitude. (Although on the day that I brew my Go Blue Brew, I wear my University of Michigan cap.) Assertively perched backward on my head, this simple headgear serves as my fashionable hair net.

On brewday I have enough to be



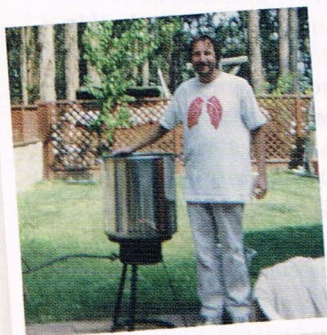
I can brew all day when I'm wearing this comfortable outfit.

concerned about without having to be pained by sore feet, a pinched waistline, the inability to stretch and reach a piece of equipment, or hair in my wort. From bottom up, my brewing uniform is functional first, fashionable second.

Michael Neuman
Salinas, Calif.

I have been a homebrewer for four years, and I brew every two to three weeks. I have an 18.75-gallon brew pot. I brew with friends or by myself, brew whenever I can. I am a

respiratory therapist when I am not a brewer, and I like to wear my lung shirt a lot when I brew.



Music to Brew By

I always listen to R.E.M. while brewing and bottling. They've been my favorite band for several years, but it was their connection with "real" beer that locked them in as my official music to brew by.

Several years ago while running my Saab in a Sports Car Club of America road rally on Cape Cod, I stopped in at the Cape Cod Brewhouse. The beer was to die for, and the food was just as good. Just when I thought the experience couldn't get any better I noticed a quote from

R.E.M. over the entrance. It read, "One small step for Cape Cod, one giant leap for real beer." I asked the waitress about the quote, and she said R.E.M. had stopped in for some beers during a tour and said the memorable quote.

I'd probably listen to R.E.M. while brewing anyway, but now I feel it's "good beer karma." Of the 24 batches I've brewed while listening to them, I've never brewed a batch I didn't like.

Roberta L. Powers
Wallingford, Conn.

Primary Fermentations

by Scott R. Russell

Don't expect me to reveal any deep, dark secrets this month. Despite the upcoming presidential primaries, despite the significance of electing a new president to begin the new millennium in January 2001, I will not be bullied into revealing for whom I intend to vote. Instead, I would prefer to honor past presidents with a recipe any one of them (prior to about 1920, anyway) might have appreciated.

Besides, I find politics in general a little boring. Especially in the United States, where there's little real substantive difference between the parties and candidates. Look at some of the other countries in the world, where you can have a candidate from a far-right, ultra-nationalist party going up against socialists, green-party candidates, moderate democrats, Maoists, Islamic fundamentalists, and a dozen others.

Wouldn't it be fun to see an American election where an ordinary-looking candidate suddenly changed his tune and turned into some weirdo? I want something more exciting than run-of-the-mill accusations about bad real-estate deals and adultery. What about someone who spices up his campaign by revealing that he was abducted by aliens? Or by admitting to being a huge fan of Kiss? Or to being a homebrewer? (Nah, that's too weird; who'd ever admit that?)

Where, oh where is this leading, you ask? To a beer that seems, at first glance, to be ordinary, mainstream, just like a lot of others, but that has a deep, dark, dirty secret that unfolds in the course of the tasting session. A beer that, despite its apparent novelty, could actually

have been brewed by contemporaries of the founding fathers.

Who knows what secrets lurk in the heart of this beer? The spice flavor starts out as a youthful indiscretion, but then it mellows to a half-forgotten adventure.



Reader Recipes

Oktoberfest

(5 gallons, extract with grains)

The yeast used in this recipe produces a malty, bock-like style.

Steve Bader

Bader Beer & Wine Supply, Inc.

Vancouver, Wash.

Ingredients:

- 7 lbs. light malt syrup

Presidential Pilsner (5 gallons, partial mash)

Ingredients:

- 3 lbs. pilsner malt
- 1 lb. carapils malt
- 3 lbs. unhopped extra-light dry malt extract
- 1.5 oz. Hallertauer hops (4% alpha acid, 6 AAUs): 0.75 oz. (3 AAUs) for 75 min., 0.75 oz. (3 AAUs) for 30 min.
- 0.125 oz. fresh ginger, grated
- Lager yeast slurry (Wyeast 2035 or 2278, or equivalent)
- 7/8 cup corn sugar for priming

Step by Step:

Heat 1.5 gal. water to 164° F, crush malt, and mix into liquor. Hold at 152° F for 90 min. Run off, sparge with 2 gal. of 169° F water.

Add dry malt to kettle, bring to a boil. Total boil is 75 min. Add 0.75 oz. hops, boil 45 min. Add

remaining hops, boil 30 min. Remove from heat, add ginger, and steep 30 min. Remove ginger, pour into primary fermenter, and top up with enough chilled, pre-boiled water to make 5.25 gal. Cool to 64° F, pitch yeast.

Ferment at 60° F for two days, then move to a cooler place (50° F) and ferment for four to six weeks. Rack to secondary and condition cold (38° to 40° F) for six weeks. Prime, bottle, and condition cool (42° to 45° F) for four to six weeks.

OG = 1.049

FG = 1.010

Bitterness = 20 IBUs

Notes:

All-grain: Omit dry malt extract, increase pilsner malt to 7.5 lbs., increase mash water to

3 gal., and sparge with 3.75 gal. water. Proceed as above from boiling, adjusting boil time to end with 5.25 gal. total volume (add water to kettle if necessary).

Extract: Reduce pilsner malt to 1 lb. and increase dry malt extract to 5 lbs. Steep pilsner and carapils malts in 2.5 gal. of 150° F water for 30 min. Remove grains, add dry malt extract, and proceed as above from boiling.

Ginger: Dried, powdered ginger will not work in this recipe because it is unpredictable and hard to gauge its strength. Fresh ginger root, or dried whole ginger, will give a more manageable and fresher flavor. Use it sparingly, because ginger is a powerful spice. This is supposed to be a sneaky, subtle flavor.

- 0.25 lb. crystal malt, 40° Lovibond
- 0.25 lb. victory malt
- 0.125 lb. chocolate malt
- 3 oz. Hallertauer hops (4% alpha acid, 12 AAUs): 2 oz. (8 AAUs) for 60 min., 1 oz. (4 AAUs) for 3 min.
- 1 tsp. Irish moss
- White Labs Oktoberfest/Märzen lager yeast (WLP820)
- 3/4 cup corn sugar for priming

Step by Step:

Steep crushed, malted grain in 2 gal. of 150° F water for 30 min. Remove the grain with a strainer. Bring water to a boil. When boiling starts, remove pot from burner and add malt syrup. Return to a boil. Total boil is 60 min. Add 2 oz. hops and boil for 15 min. Add Irish moss and boil 42 min. Add remaining hops and boil 3 min. more. Remove from heat. Fill your sanitized carboy with 2 gal. cold water. Strain the hot wort into the carboy and top off to the 5-gal. mark. Pitch yeast when beer is colder than 78° F.

Ferment at 52° to 58° F for about two weeks, or until fermentation stops. Prime and bottle as usual.

OG = 1.054
FG = 1.016
Bitterness = 35 IBUs
5% ABV

**Heather Ale
(10 gallons, all-grain)**

Here is a beer my wife and I tried just because it sounded interesting. As it has no hops, the flowers give this ale a very interesting bitterness. Not bad — interesting.

*Hal Warrick
Decatur, Ill.*

Ingredients:

- 14 lbs. Scottish ale malt
- 1.5 lbs. crystal malt, 20° Lovibond
- 2 lbs. heather flowers (25 handfuls), crushed by hand
- 2 tsp. Irish moss
- Scottish ale yeast slurry
- 1 1/2 cups corn sugar for priming

Step by Step:

Mash the grain at 160° F for 60 min. and sparge to collect roughly 12 gal. of wort.

Add 13 handfuls of crushed heather flowers to the brew pot. Total boil is 60 min. Boil 50 min., add Irish moss, and boil 10 min. more. Remove from heat and add 8 more handfuls of crushed heather flowers to the brew pot. Chill to 70° F, pour into two 5-gal. carboys, and pitch yeast.

Ferment at 70° F for one week. Take 0.5 gal. from each carboy (1 gal. total), pour into brew pot, add remaining crushed heather flowers (about 4 handfuls), and steep at 160° F for 20 min. Return 0.5 gal. to each carboy and let ferment for another week at 70° F. Prime and bottle or keg. Rack to bottling bucket to remove flowers before bottling.

OG = 1.048
FG = 1.008
Bitterness = 0 IBUs (no hops) ■

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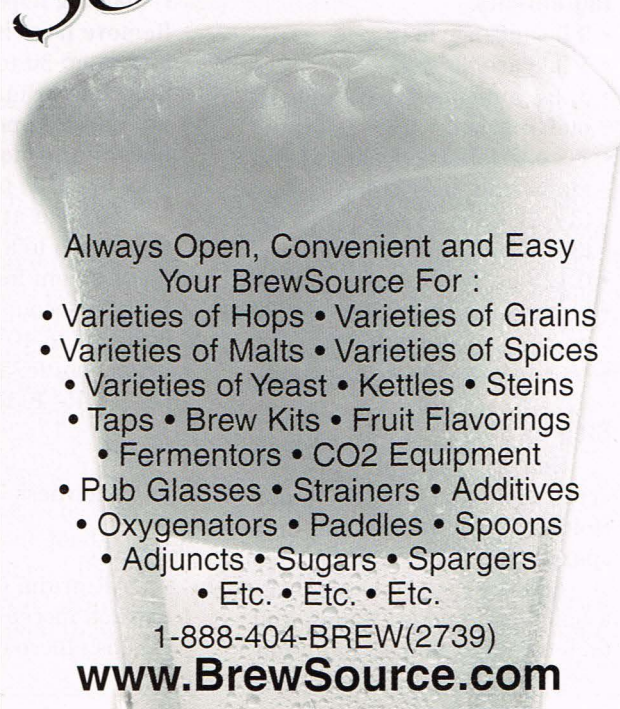
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Yeast Survival in High-Alcohol Brews

Mr. Wizard

I am interested in brewing some high-gravity beers, namely an imperial stout and a barleywine. I have noticed that there are now some liquid yeast strains available (such as Wyeast's Belgian Trappist) that can tolerate alcohol content up to 12 percent. If those strains are not used, I have been told to try pitching Champagne yeast during secondary fermentation. Is the addition of Champagne yeast necessary for the high-gravity brews, and if so, how will that affect the flavor of the finished beer?

*David Clark
via e-mail*

It is true that some yeast strains do better than others with high-gravity fermentations. However, in my experience this concern is overstated. One problem that comes up with high-gravity fermentations is that the yeast flocculates before the fermentation is complete and the resulting beer is too sweet. Yeast strains that are powdery, like many wine strains, stay in suspension longer than highly flocculent strains and tend to leave the beer drier.

The things I am mindful of when brewing higher gravity beers are yeast health (viability and vitality), pitching rate, wort aeration, and fermentation temperature. Yeast health is very important; dead yeast cells don't ferment.

This means if you reuse yeast from batch to batch, you need to make sure the yeast hasn't been used too many times or stored for too many days since it was cropped. Also, yeast from a high-gravity fermentation should not be reused,

because the higher alcohol levels weaken the cell membranes.

Pitching rate is also key. The textbook pitching rate is 1 million yeast cells for every milliliter of wort and degree Plato of wort gravity (about four specific gravity points). Underpitching is a common mistake in homebrewing, and this error is frequently amplified when brewing stronger beers.

Wort aeration provides yeast cells with oxygen used in the synthesis of unsaturated fatty acids, which are important constituents of the cell membrane that provide flexibility and strength. There have been numerous studies that relate alcohol tolerance to unsaturated fatty acids in the cell membrane.

In practice, oxygen solubility decreases as wort gravity increases. The take-home message is that the aeration technique

becomes more important with these beers. The solubility dilemma also directly relates to pitching rate. If there is less oxygen available for growth, then a logical solution is to add more yeast to the fermenter.

The last key factor is temperature. While very warm fermentations zip along at a fast clip, they also can produce funky, fruity beer. A very cool fermentation might be better for a clean flavor, but it might lag and fail to finish. I prefer a cooler fermentation armed with enough healthy yeast and oxygen.

Hydrometer measurements are very useful to determine when the fermentation is over. Counting

bubbles burping from an airlock is approximate at best. High-gravity beers can take weeks to finish, and the bubble rate tapers off significantly.

Now that I have tortured you with information not relating to what you asked, back to the original question. Yeast strain affects beer flavor in numerous ways. One thing to count on is that your beer will taste different if you change strains. Champagne yeast won't make your beer taste like wine or Champagne, but it might make a drier beer than a highly flocculent strain.

My advice is to use a strain that has moderate flocculation properties, has an attenuation rate of more than 75 percent, and produces flavors you like. As long as you follow this advice, most brewing strains will do fine.

Mr. Wizard

I have been thinking about making soda again for friends and family. I like kegging, but transporting, cooling, and dispensing can be problematic. Bottling is much more convenient, but the yeast can be a turnoff.

I do not want to make a counter-pressure bottle filling system, so I was at somewhat of an impasse. Then I remembered a little trick we used to do. We would take a plastic soda bottle with a small amount of water in it, then add a little dry ice, put on the cap and throw it! The dry ice would melt, causing the pressure to build up enough to cause the bottle to explode.

So I was thinking that you should be able to add a small amount of dry ice to a two-liter bottle of soda and allow it to carbonate. I am thinking of experimenting with this to see if I can determine the right amount of dry ice to add that will carbonate the soda but not cause the bottle to explode.

Do you know of anyone who has



tried this or something like it? Do you see any obvious flaws in my reasoning?

*David Wilkes
via e-mail*

I too have thought about this idea, but only very briefly because of its high risk. I worked one summer at a facility that had a small can seamer. We did the exploding container trick with a soup can. When that thing blew the lid let loose like a flying saucer and flew a couple hundred feet.

An exploding plastic bottle might not be quite as dangerous as a soup can, but it is still dangerous. I have also accidentally burst glass bottles with counterpressure bottle fillers and always wear safety glasses when I use those devices. I have done my fair share of crazy things and feel passionate about safety in the brewery. There already are enough dangers with hot wort and cleaning chemicals.

There is merit to your idea,

however. Those simple gas laws taught in high-school chemistry have a practical use in brewing. Most sodas contain about 3 volumes of carbon dioxide. That translates to 3 liters of carbon dioxide gas at standard temperature and pressure (STP in chemistry jargon) per liter of soda. One mole of an "ideal gas" (as described in the Ideal Gas Law) occupies 22.4 liters at STP. This means that 1 liter of soda with 3 volumes of carbonation contains 0.1339 moles of carbon dioxide. The molecular weight of carbon dioxide is 44 grams/mole, so you need to add 5.9 grams of carbon dioxide per liter of soda. If you use a two-liter bottle, you'll need 11.8 grams, which is equal to about 0.4 ounces.

This weight is in the do-able range for a nice kitchen balance. A 12-ounce glass bottle, by comparison, in addition to being a very dangerous container for this method, would require only 2 grams for the same carbonation level. That weight is too

small for most kitchen scales.

One of the nice things about dry ice is that it sublimates, or passes directly from the solid state to the gas state at atmospheric pressure. This property makes it easy to weigh. If the chunk is too heavy, let it sit on the scale until the excess weight sublimates away. Then quickly throw the chunk into your soda bottle filled with flat soda. Screw the cap on as fast as humanly possible to minimize loss of carbon dioxide.

Like many methods used to brew beer at home, this technique has its risks. I don't recommend trying this method unless you have a reliable scale and are using plastic soda bottles or a soda keg equipped with a safety relief valve.

Mr. Wizard

My boyfriend recently started homebrewing beer and wine (it's fantastic!). He is always curious how much



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CIRCLE 7 ON READER SERVICE CARD

CIRCLE 22 ON READER SERVICE CARD

alcohol is in the beer or wine (and has a floating hydrometer that measures it indirectly by measuring at the start and at the end). Are there any at-home kits that measure alcohol content?

*Idelle Jones
via e-mail*

Most homebrewers estimate the amount of alcohol in beer using a hydrometer as you describe. Although many brewers make very confident claims about the strength of their beer based on hydrometer measurements, especially when they think it's really potent, the method is fairly crude and not reliable for accurate measurements of alcohol content. There are two methods that hypothetically could be performed at home to directly measure alcohol in beer or wine.

Distillation is the most common method used in the commercial industry. Basically, a known volume of beer is poured into a distillation flask, brought to a boil, and the alcohol vapors are collected by running them through a condensing coil. This process is continued until half of the original volume is collected from the condensing coil. This mixture is simply alcohol and water, and its specific gravity directly correlates to the alcohol concentration.

But unless your boyfriend has a real use for a home chemistry lab, this method is prohibitively expensive — a \$1,000 minimum investment.

Another way to determine the alcohol strength of a beer or wine is to measure its boiling point. Although this method is not typically used for beer, it is commonly used in the wine industry. The nice thing about the method is that it is very quick and requires a relatively simple device called an ebulliometer.

The nifty thing about the ebulliometer, besides its cool name and simplicity, is that the instrument itself is somewhat of an antique. Its appearance is hard to describe, but they are often made of brass, are heated with an alcohol burner, and are outfitted with a little condensing unit and a thermometer.

You might be able to find an

ebulliometer on the Internet, for example on E-Bay; at an antique store specializing in scientific equipment; or at a winery supply company, for example the Compleat Winemaker in St. Helena, Calif. To use an ebulliometer you must have a chart relating the boiling point to alcohol concentration.

Although this is cheaper and easier than distillation, you probably

will have to shell out a couple hundred bucks for an ebulliometer. If I were your boyfriend, I would be pleasantly surprised to receive such an unusual and functional gift.

Mr. Wizard

I read that Guinness gets its distinctive flavor by adding 3 percent

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soured beer to the final product. I also know one way to sour a poured beer (such as a porter) is to add 1 teaspoon of malt vinegar. To make a home-brewed Guinness, can I add a small amount of malt vinegar to my brew at any stage, and if so when should I add it? I am worried about the acidic vinegar being detrimental to the yeast or souring the entire beer too much.

*Matt Prator
Davis, Calif.*

I don't know the exact amount of sour beer added to Guinness, but it is well known that some secret ingredient is added as a flavoring. In fact the Dublin, Ireland, brewery produces all the "Guinness Flavor Essence" (GFE) in the world. This key ingredient is shipped to all the breweries around the globe that brew Guinness under contract.

The GFE not only imparts a slight sourness to the famous stout, it also adds color. Guinness brewed outside of Dublin begins its life a

straw-colored beer and is transformed into stout after fermentation and before filtration.

Attempting to homebrew a Guinness facsimile requires some information about GFE. This is one of those secret ingredients, like Coca-Cola's ingredient "X," that you can't find much about on the Internet or in a library.

Some people suggest that GFE simply contains sour beer, presumably from a lactic acid fermentation, and others believe it also might have a wild yeast phase from *Brettanomyces* to give it a subtle wet horse blanket aroma similar to the aroma of lambic beers. Whatever the ingredient, there is no doubt that draft Guinness has a flavor that other Irish draft stouts lack.

The best time to adjust beer flavor with ingredients such as malt vinegar is after fermentation and aging, because it is easier to taste the effect of the ingredient, even though the amount added probably

would have little to no effect on your fermentation.

I have had success making pseudo-lambics using a similar plan. A blend of lactic and malic acids, malt vinegar, fruit extracts, and sugar added to a light beer can produce a surprisingly tasty beverage. This is one area in which many home- and microbrewers run into philosophical quandaries. It just seems strange to add all of these things — these "chemicals" — to beer.

What is a "chemical" anyway? All matter composed of elements is technically a chemical! The way I see it lactic acid produced from *Lactobacillus delbrückii* (like in Berliner Weise) is no different from lactic acid produced from a large-scale *Aspergillus niger* (the bug that is used to make bulk lactic acid) fermentation, and carbon dioxide excreted from yeast is no different from the stuff in a cylinder.

Big brewers do this sort of thing all the time. Post-fermentation hop additions for bitterness and/or aroma, color adjustments, fruit syrup for some crazy new fruit concoction, adding dilution water to high-gravity fermentations (see "High-Gravity Brewing for All-Grain Brewers," page 34), and adjusting carbonation levels by injecting carbon dioxide is common. I agree that these practices take away from the beauty of traditional brewing in which all ingredients are added at about the same time and the beer is what it is. However, what they do give the brewer is another tool to use. ■

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Mr. Wizard's Address

Do you have a question for Mr. Wizard? Write to him c/o *Brew Your Own*, 216 F St., #160, Davis, CA 95616. Or send e-mail to wiz@byo.com.

Mr. Wizard, BYO's resident expert, is a leading authority in homebrewing whose identity, like the identity of all superheroes, must be kept confidential.

In Anticipation of Spring

by Mikoli Weaver

This month we look forward to the beginning of spring and to St. Patrick's Day next month. We will brew a traditional Irish dry stout and a cream ale to use for black and tans or just for drinking alone.

Cream Ale

Ask three people what cream ale is and they likely will give three different answers.

In fact cream ale is a North American twist on European tradition. Demand for light, pale lagers swept Europe in the mid-19th century after the invention of practices that led to pale malts and subsequent pale beers.

Cream ale is a cold-aged ale created in response to this trend. Kölsch, which is a top-fermenting beer made with ale yeast, and pilsner influenced this style. Currently, the Cologne (Köln), Germany, classic kölsch and California common beer such as Anchor Steam are most closely related to this clean and

cold-aged ale.

The result of all this hybridization is a uniquely clean and crisp beer, like a pale lager, with hints of complex ale characteristics. Cream ale is highly carbonated, light straw in color, and low in alcohol. Several sets of numbers can be found for cream ale guidelines, but those used here are: original gravity 1.044 to 1.060 (11° to 15° Plato), bitterness 10 to 22 IBUs, color 2° to 5° SRM, and alcohol by volume 4 percent to 5.5 percent.

Grain and Adjuncts

Kölschbier can include up to 30 percent wheat in the grist bill, and cream ale also is made this way on rare occasion. It is most commonly made with some sort of corn adjunct such as flaked corn for mashing or corn syrup poured directly into the boil. A superior cream ale, like any other ale, is brewed using all-grain mashes.

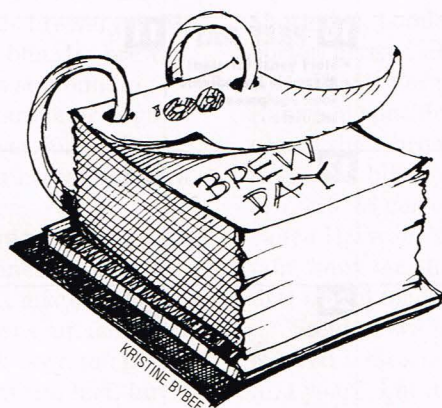
Our recipe calls for basic North American pale two-row malted barley, some carapils as usual, and a touch of 10° Lovibond crystal malt. The resulting beer will be light and clean but possess body and maltiness like a kölsch, steam beer, or pilsner. The yeast flavor of a cream ale is usually very nondescript, similar to a kölsch.

Brewers brew cream ales with adjuncts to create a lighter style more palatable to non-micro drinkers. In this case the use of corn is warranted. Anyone looking for a lighter beer to offer friends can experiment with adjuncts.

Cream ales should not, contrary to myths, contain cream or milk sugar.

Hops

When it comes to hopping a



cream ale, the rules are just as ambiguous. Some use traditional, noble hops, while others stay with

North American hops. It is really up to the brewer, although American hops seem like the logical choice for

style purity.

Yeast and Fermentation

Cream ale, despite the name, is often fermented with lager yeast or a combination of lager and ale yeast. Sometimes plain old ale yeast is used. But the overall strategy is to ferment at ale (or low ale) temperatures and condition at lager temperatures, no matter what type of yeast is used. Diacetyl (a buttery flavor) should not be present in the flavor of the beer. The fruity flavors from esters also should be minimal. Think light lager.

Regular readers of this column will remember brewing kölschbier (August '99 BYO). Cologne brewing laws dictate that the beer be fermented using a special kölsch yeast (an ale strain) between 64° and 72° F, secondary fermented at 57° to 64° F, and conditioned at 50° F for at least three weeks.

The steam beer in the February '99 Style column was fermented and conditioned at 58° F to emulate the practices of Anchor Brewing Co. Our cream ale will be sort of a compromise between the two beers, with primary and secondary

Brewing Schedule Notes

Feb. 3, Thursday

Prep day

Start yeast culture for cream ale today and soak equipment in sanitizer until brewing on Saturday.

Feb. 5, Saturday

Brew day

Brew cream ale and record original gravity. Primary fermentation begins today.

Feb. 10, Thursday

Prep day

Start yeast culture for stout today and soak equipment in sanitizer until brewing on Saturday.

Feb. 12, Saturday

Brew day/Transfer

Brew stout and record original gravity. Primary fermentation

begins today.

Cream ale is racked to secondary today. Record gravity and continue fermenting for seven more days.

Feb. 19, Saturday

Bottle cream ale/Transfer Irish stout

Cream ale should be ready for bottling today. Condition cold (50° F) for three weeks.

Rack stout to secondary fermenter today and continue for seven more days.

Feb. 26, Saturday

Bottle Irish stout

Stout should be ready to bottle today. Bottle and condition for one more week.

March brews: Belgian dubbel and pilsner.

February 2000

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1	2	3 PREP DAY • Start yeast for cream ale • Assemble ingredients • Soak equipment in sanitizer	4	5 BREW DAY • Brew cream ale • Primary fermentation starts
6	7	8	9	10 PREP DAY • Start yeast for stout • Assemble ingredients • Soak equipment in sanitizer	11	12 BREW DAY • Brew stout • Primary fermentation starts • Rack cream ale to secondary
13	14	15	16	17	18	19 BOTTLE • Rack cream to bottling vessel • Prime and bottle • Start conditioning for three weeks (March 15) • Rack stout to secondary
20	21	22	23	24	25	26 BOTTLE • Rack stout to bottling vessel • Prime and bottle • Start conditioning for one week (March 8)
27	28	29				

fermentation at 65° F and a three-week conditioning at 50° F.

Acceptable lager yeasts are Wyeast 2112 (California lager), 2565 (Kölsch), and the clean-fermenting 2272 (North American lager). Or try White Labs WLP810 (San Francisco lager) or WLP830 (German lager). On the ale side your yeast choices should be equally clean-fermenting, such as Wyeast 1056 (American ale) or 1007 (German ale), or White Labs WLP001 (California ale) or WLP029 (German ale/kölsch). Of course if you insist on mixing yeast strains, any of the above can be combined.

Commercial Examples

Commercial examples to try before brewing are Genesee and Hudepohl-Schoenling Little Kings, as well as Riverside Brewing Raincross Cream Ale (California), Rogue Honey Cream (Oregon), and Hubcap Hublight Cream (Texas).

Irish Stout

Irish stout is Dublin's claim to world beer fame. Irish stouts are typically dry, well-attenuated ales with a distinct bitterness from abundant hopping and a telltale lingering acrid flavor in the finish that comes from the use of highly roasted, unmalted barley.

When people think of Irish stouts, dry stouts, or Dublin stouts, the brand that is most commonly named is Guinness. Guinness stout dates back to 1759 when Arthur Guinness started his brewery at St. James's Gate in Dublin. He brewed ales for Dublin and surrounding cities and a few years later began brewing a darker version of the popular porter that he called Extra Stout.

One misconception surrounding the genesis of Guinness is that the beer was actually a mistake. Supposedly there was an accidental burning of the malt used to create an entirely different product, but the end brew was so good that the brewery decided to keep it that way.

It seems the Guinness myth is a variation on the notion that Ralph Harwood, owner of the Bell Pub in

Shoreditch, London, and inventor of porter, arrived at his beer the same way. This is not true because Harwood specifically was trying to create the "three threads" of beer that were blended to make one keg or bottle of porter. It was originally called Harwood's Entire. It is certain, however, that porter was the first model for Guinness Stout.

Stout as we now know it has evolved a bit since Arthur Guinness' first years, but it is essentially unchanged, having the same ingredients and the same yeast strain. Guinness Extra is a wonderful experience of roasted malt flavors, hop bitterness, and classic yeast

character all wrapped up in the soft, creamy texture of nitrogen.

Other good examples of stout are Murphy's and Beamish. The Murphy brothers founded their brewery in 1856 at Cork's Lady's Well in an old orphanage that occupies several acres of land in the sleepy town of Cork, Ireland. The malthouse and some other parts of the brewery have been renovated, but the original look of the beautiful old building has been maintained. Murphy's stout is made from locally grown barley and spring water, which gives the beer a very traditional flavor. Murphy's is more mild than Guinness, with less bitterness

2000 Style Calendar

January Barleywine, Roggenbier

Just like last year's schedule, a barleywine to age until the new-year celebration and a flavorful German rye beer to balance out the dark season a bit.

February Cream Ale, Dublin Stout

Black and tan brewing month. A light, slightly sweet cream ale and a traditional Irish stout for St. Patrick's Day.

March Belgian Dubbel, Pilsner

Belgian Brewing 101 with a Chimay red cap clone followed by Lager Brewing 101 with a traditional Czech pilsner.

April Maibock, Scotch Strong Ale

Maibock, of course, for celebrating next month and a bold, peated Scotch ale high in gravity and flavor.

May IPA, Mild Ale

An old standby, a highly hopped American-style IPA and a new English beer to the lineup, a mild brown ale.

June Golden Ale, Oktoberfest

A "lawnmower" beer for the start of summer. And a tasty Oktoberfest. It will be aged until early September.

September Dortmunder, Oatmeal Stout

Dort is a light European export lager. And a new stout to this year's schedule — an English oatmeal.

October ESB, Weizenbock

A deep amber, caramel-laden ESB and a gigantic German winter seasonal weizenbock to age until late December to early January.

November Bavarian Dunkel, Belgian Tripel

This month has two warming beers to fight the cold winter nights. A dark, chocolate dunkel and a high-gravity Belgian tripel.

December Christmas Ale, Spiced Ale

Our annual Christmas ale makes another appearance and a lightly spiced dark ale with a distinctly festive edge to end the year.

and roasted barley flavor. It's very smooth when served under creamy nitrogen dispense.

The Beamish and Crawford brewery was founded in 1792, quickly growing to be the largest

should be dark, full, bitter, and dry.

There are several different varieties of Irish stout, depending on the source you reference. This recipe is a very straightforward formula with solid characteristics.

This recipe uses a Fuggle and Kent Golding program, but you could substitute at will.

The most appropriate yeast is an Irish ale yeast such as Wyeast 1084 (Irish ale) or White Labs WLP004 (Irish ale). Wyeast 1098 (British ale), 1318 (London ale III), and 1335 (British ale II) or White Labs WLP005 (British ale) or WLP002 (English ale) also can be used, but the resulting beer won't be a true Irish stout. Unfortunately, most imported Irish stouts are filtered and/or pasteurized, so culturing from the bottle is impossible. Guinness, Murphy's, and Beamish are no exceptions.

Defining a Few Terms

SRM (Standard Reference Method) and degrees **Lovibond** are two methods of describing color. The scales provide roughly the same number, but SRM uses a more sophisticated method and is more accurate. For example a light yellow beer is 2° SRM (or 2° Lovibond); amber is 13° SRM; brown is 22° SRM. Malt color ratings are typically expressed

in Lovibond.

IBU (International Bittering Units) is a measurement of hop bitterness in beer. For example a beer with 27 IBUs is mild. A beer with 42 IBUs is very bitter.

Degrees **Plato** is a liquid-density scale that also is expressed as **specific gravity**, which is read on a hydrometer. A beer that is 12° Plato is 1.048 specific gravity.

brewery in Ireland in the early to mid-1800s. In 1962 Carling O'Keefe of Canada purchased the brewery, but O'Keefe sold it to Elders of Australia 25 years later. It continues to produce stout, but it was not until 1992 that Beamish became available in the United States, gaining a foothold in the test-market pubs of Boston's Irish community and elsewhere.

Much like any other style of beer, each brewery has a different house flavor that adds to the experience of drinking each brand of stout. Each brand is available in draft (under nitrogen), in a bottle, and in widget cans, which contain a nitrogen device that gives the beer the same qualities as nitrogenated draft dispense. Irish stout that's been nitrogenated is really the best way to drink this style of beer.

Formulation

This type of stout is dominated by unmalted, roasted barley. There also should be a background of caramel and earthy pale malts, but they should be secondary flavors used to enhance and deepen the roasted flavor. The goal is to create a good balance within a beer of fairly low gravity while giving as much flavor as possible. Irish stout

Traditional Guinness Stout has 65 percent pale malt, 25 percent raw barley, and 10 percent roasted barley. With other Irish stouts the pale base is supplemented by a dark-roasted, 120° Lovibond caramel malt for color and richness, and with the mandatory roasted barley for balance and earthiness. Carapils and flaked barley are added by some brewers for body and mouthfeel. Note: When using any flaked product, choose a pre-gelatinized version.

Some other variations include the use of brown malt, chocolate malt, and black patent malt. Just keep in mind that you are not trying to brew an overwhelmingly powerful beer. The original gravity should be 1.048 to 1.052 (12° to 13° Plato) and be well attenuated to the point of being perceived as dry.

There is one thing Guinness has in its flavor profile that can never be re-created at home. It is the secret flavor extract that is added to the beer. It is made of several ingredients known only to those who make and blend it. (See Mr. Wizard, page 9.)

The hops used in Irish stout should be typical English varieties such as Kent Golding, Fuggle, Bullion, Bramling Cross, and others.

Cream ale (5 gallons)

Ingredients:

- 6.5 lbs. pale malt
- 0.5 lb. carapils
- 1 lb. crystal malt, 10° Lovibond
- 1 oz. Cascade hops (6% alpha acid, 6 AAUs) for 90 min.
- 0.75 oz. Willamette hops (3.5% alpha acid, 2.6 AAUs) for 15 min.
- 1 pt. starter of Wyeast 2272 (North American lager)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 2.5 gal. of 150° F water for 60 min. Sparge with enough 168° to 170° F water to collect 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil, add Cascade hops and boil 75 min. Add the Willamette hops and boil 15 min. more. Whirlpool and cool to 65° F to pitch starter. Oxygenate/aerate well.

Ferment at 65° F for seven days, then transfer to secondary and ferment at 65° F for seven more days or until gravity is about 1.012 (3° Plato) and fermentation stops. Rack, prime, and bottle condition at 50° F for three weeks before drinking.

Extract with Grain Option:

Substitute 6 lbs. pale malt extract syrup for the pale malt. Increase the first hop addition to 1.25 oz. (7.5 AAUs) Cascade hops for 60 min. Start with 5 gal. of

150° F water. Steep crushed grain for 30 min. Sparge grains with enough 170° F water to make 5.5 gal.

Heat to boiling and add extract syrup. Total boil will be 60 min. At beginning of boil add Cascade hops and boil 45 min. Add Willamette hops, boil 15 min. more. Whirlpool and cool to 65° F to pitch starter. Oxygenate/aerate well.

Follow fermentation schedule for all-grain version.

OG = 1.048 (12° Plato)

Bitterness = 28 IBUs

Color = 5° SRM

4.5% ABV

Irish Stout (5 gallons)

Ingredients:

- 7.5 lbs. Irish or British pale malt
- 1.5 lbs. flaked barley
- 0.5 lb. roasted barley
- 1.5 oz. Fuggle hops (4.2% alpha acid, 6.3 AAUs): 1 oz. (4.2 AAUs) for 90 min., 0.5 oz. (2.1 AAUs) for 45 min.
- 1 oz. Kent Golding hops (5.4% alpha acid, 5.4 AAUs) at end of boil
- 1 pt. starter of Wyeast 1084 (Irish ale)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 3 gal. of 150° F water for 60 min. Sparge with enough 168° to 170° F water to collect 5.75 gal. of wort.

Total boil is 90 min. At beginning of boil, add Fuggle hops and boil 45 min. Add second charge of Fuggle hops and boil remaining 45 min. At end of boil, add Goldings. Whirlpool and cool to 69° F to pitch starter. Oxygenate/aerate well.

Ferment for seven days, then rack to secondary fermenter and continue for seven more days or until fermentation is done or gravity is 1.013 (3.25° Plato). Prime and bottle. Allow to carbonate and age at least seven more days before drinking.

Extract with Grain Option:

Replace the pale malt and

flaked barley with 8 lbs. Irish or British pale malt extract syrup. Increase the first hop addition to 1.25 oz. (5.3 AAUs) Fuggle hops for 60 min.

Start with 5 gal. of 150° F water. Steep grain for 30 min. Sparge grains with enough 170° F water to make 5.5 gal.

Heat to boiling and add extract syrup. Total boil is 60 min. At

beginning of boil, add Fuggles, continue for 15 min., and add remaining Fuggles. Boil for 45 min. more, add Goldings, and whirlpool. Cool to 69° F and pitch starter. Oxygenate/aerate well.

Follow fermentation schedule for all-grain version.

OG = 1.052 (13° Plato)

Bitterness = 25 IBUs

Color = 50°-plus SRM ■

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CIRCLE 11 ON READER SERVICE CARD

Basic Troubleshooting

In virtually every brewing text-book or related literature the importance of keeping good records is emphasized. Usually after only a few batches many brewers already have compiled copious notes or brewing logs, but then what?

Good brewing logs should function as more than just blotter paper to help keep bottle rings from forming on the kitchen counter during a brew session. The information recorded can be used to help track down possible sources of flavor problems in current batches, to help guide improvements or modifications in subsequent batches, and to create the base to formulate entirely new recipes that might not be directly related to the beer style in question.

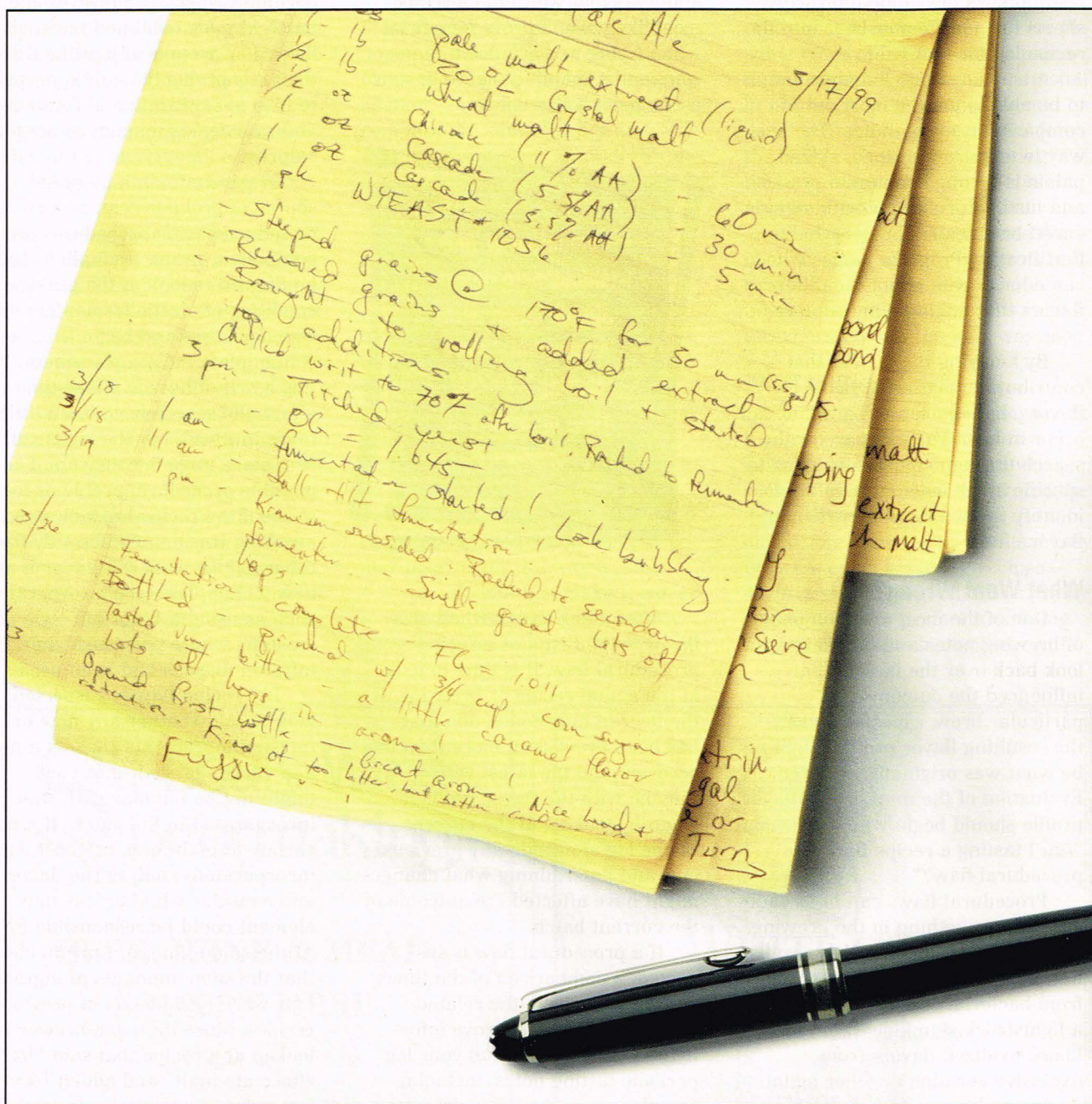
Used properly, brewing logs can help to minimize mistakes and help improve future batches of homebrew, but before brewers can depend on brewing logs for information, they need to have good

records to begin with. Most brewing literature contains information on creating a good file-building system ("Create Your Own Brewing Spreadsheet," October '96 BYO; "Setting the Record Straight," November '98 BYO) that makes it easy for the important factors influencing the final flavor profile of a homebrew to be measured and recorded in a useful, easy-to-review format. Once you have a collection of information in the form of your brewing notes, how can we use what is recorded?

To get the most out of brewing notes, it is important to rely on the most valuable data-gathering tools available to any brewer: the senses of taste, touch, smell, sight, and sound ("The 5-Sense Beer Test," August '99 BYO). It is only by actually experiencing the beer in a sensory manner and relating these sensory experiences to the brewing logs that the data recorded can be used in a constructive manner. One

How to Use Your Brewing Rec

John Oliver



ords to Make Better Beer

good method is to incorporate the tasting notes or competition score sheets for a particular beer into the recipe log for that beer.

A trained palate is important to be able to get the most out of comparing brewing notes. The best way to acquire a trained, skilled palate is through continual practice and tasting, preferably with experienced beer tasters or Beer Judge Certification Program judges who can educate you about the different flavors that might be encountered in beer.

By knowing the factors that contribute to myriad possible flavors, both good and bad, that can occur in beer, you can narrow the search through your brewing log to specific areas when attempting to identify the source of a particular flavor.

What Went Wrong?

One of the most common uses of brewing notes and logs is to look back over the factors that influenced the outcome of a particular brew, especially when the resulting flavor profile might not be what was originally expected. Evaluation of the undesirable flavor profile should begin with a question: "Am I tasting a recipe flaw or a procedural flaw?"

Procedural flaws can be broadly defined as anything in the brewing or handling of the beer that results in an off-flavor, such as a sourness from bacterial contamination, a lightstruck skunkiness, or cardboard oxidized flavors from excessive aeration or other agitation during racking or transfers. Recipe flaws can be characterized by unusual flavors that occur in an otherwise clean beer, such as excessive bitterness from hops or extremely fruity characters from yeast.

It is important to realize that flavors in beer can occur from a variety of sources, and there is a considerable gray area of overlap. But when trying to track down potential sources of flavors, it helps to begin by narrowing the search to a particular area of the brewing

notes. Puzzling over the various hop additions that went into a recipe most likely won't prove beneficial when trying to track down the source of a mouth-puckering, sour astringency for example.

Evaluation of the
undesirable flavor
should begin with
a question: "Am I
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flaw or a flaw in
procedure?"

After determining whether a flavor is the result of a recipe or procedural flaw, it is time to look at the actual recipe or brew log. If the beer in question is one that has been brewed on more than one occasion and the latest version is the one with the flavor problem, begin by looking at the current recipe log alongside any previous logs and determining what changes might have affected the outcome of the current batch.

If a procedural flaw is suspected, a comparison of the times and procedures in the related batches can usually prove informative. Incorporate into your log periodic tasting notes, including samples taken during hydrometer tests or racking, transfers, and kegging or bottling. A look at the periodic tasting notes can indicate at what point a process error might have occurred and help to narrow down the search for what might have gone wrong to affect the current batch of beer.

For example if the finished beer shows obvious signs of bacterial contamination yet the tasting notes record that everything smelled and tasted fine at bottling time, then a contamination introduced as part of

the bottling or kegging might become suspect. If, however, the batch already exhibited unusual flavors or aromas at bottling time, then it is probably more appropriate to look at sanitization of fermenters and transfer equipment as possible culprits.

In this manner, a potential source of problems can be narrowed to specific procedures or equipment. In the example it would be natural to look at the physical condition of plastic fermenters or transfer hoses and begin to contemplate their replacement. If this batch of beer is a first-time effort, the search becomes a little more involved, but the log is still the first place to go for answers. For possible procedural problems look to see if the recipe log indicates that anything was done differently from the usual brewing routine or if any new techniques were incorporated, such as using a decoction style of mashing where previously only infusion mashes had been used.

If a recipe flaw is suspected, look to see whether any new or unusual ingredients such as a new hop variety or malt that you might not be familiar with was incorporated in the batch. If a new variety of malt, hop, or yeast were incorporated, analyze the flavor and consider whether this new element could be responsible for it. At the same time, be sure to check that the same amounts of ingredients were included as in previous recipes. More than one brewer has looked at a recipe that said "1/4 lb. chocolate malt" and added 1/4 cup instead, or instead of using 0.5 lb. dry malt extract included 5 lbs., unintentionally generating a substantially different outcome than expected.

If the same ingredients and amounts were used as in previous recipes, look to see whether there are any clues as to the condition of the ingredients. A substantial change in alpha ratings on hops can indicate a hop variety from an entirely different crop or year, with subtle differences in aroma and flavor.

Malts and malt extracts change over time. If, for example, the grains used were the last part of a 50-pound bag purchased several months previously or if the grains were crushed several weeks before being used, then a change in the quality of the ingredients could be influencing the final flavor in the beer.

Remember that regardless of whether the flaw is clearly identifiable or not, as you are tasting the beer and reviewing your log be sure to jot down additional tasting notes of what you are experiencing and any suspected causes. Even if it is not possible to absolutely identify the source or cause of an unusual flavor immediately, don't give up. As your brewing experience grows and through contact with other brewers, it is quite possible that you will be able to look back later and identify the probable cause of the difficulties long after the last bottle of the batch has disappeared.

What Went Right?

Just because that latest batch of brew came out exactly as you had hoped and tastes great does not mean that the recipe log is unimportant. Refer back to the log and compare the same factors that you would if there were an undesirable or out-of-specification flavor. Were new ingredients or techniques used? If so, consider using the methods or ingredients in future batches of beer.

Keeping good records should not only make it easy to replicate the same beer in the future, it should also make it easy to share the particulars of a successful brew with enthusiastic brewing friends who want to brew their own. Again, do not forget to include periodic tasting notes, along with any thoughts regarding why the particular beer tastes the way it does.

Not only will this make it easier to replicate the beer and spot any potential problems with future

batches, but the information also will prove useful when creating entirely new recipes that call for the same types of ingredients or procedures, especially if they are unusual in nature. A good example would be when trying to brew a wassail for the winter season incorporating herbs and spices. It can be a great help to be able to look back at another recipe, a pumpkin ale for instance, and note the amounts and types of spices used as a baseline for determining the amounts to be incorporated into the new wassail.

What to Brew Next?

Notes are particularly important if your next batch of homebrew is going to be a repeat of a previous recipe. They help you determine the ingredients and methods to use to ensure the same great results. Many brewers enjoy tweaking recipes slightly, shifting a good flavor profile slightly to try to perfect it or using new methods and ingredients with

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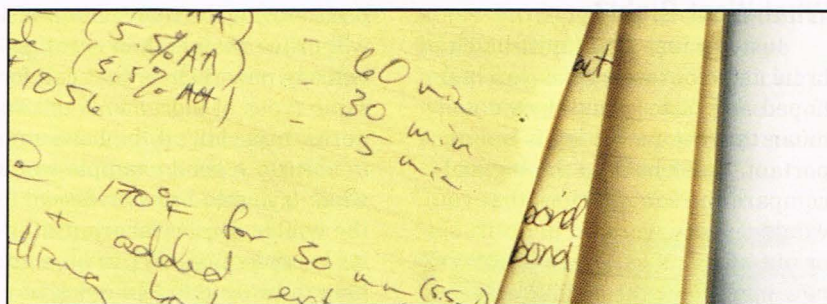
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Keeping good records should make it easy to replicate the same beer in the future. Be sure that your notes reflect the difference between procedural flaws, such as poor timing, and recipe flaws.

known recipes to determine what influence these factors can have on future brews.

The important thing to remember when experimenting in this fashion is to minimize the amount of changes made to any one particular brew. When too many factors are changed at once, it can become difficult to determine which one had the greatest influence on the outcome. A great beer might result, but the finished beer could be so different from the predecessor that it is difficult to know exactly what contributed to the improvement — or decline — in the finished product.

There is one particularly good way to experiment with different post-brewhouse ingredients or methods, such as different yeast strains, fermentation methods, or the addition of post-fermentation flavorings such as hops, spices, or extracts. Brew one batch of base beer with known characteristics, then split the batch into multiple

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fermenters each with a fraction of the volume of the original batch. Incorporate minimal changes into each of these separate fermentations. It will be easy to compare the notes on each of the finished products and evaluate a number of different variables while only going through the work and expense of a single batch of homebrew.

The notes from previous recipes also can prove invaluable when creating a new beer. For all-grain and partial-mash brewers it is important to know the level of extraction efficiency that can be expected. This is crucial in determining how much grain needs to be used for the mash. Efficiency easily can be determined by looking back over previous batches. Determine an average by looking at batches using similar methods, equipment, and materials. This information is then plugged into any one of the various formulas available to determine efficiency, whether in terms of a percentage or

expressed as points of extract per pounds of malt per gallon of finished wort. With this information in hand, it will be a simple matter to calculate the amount of malt necessary to come close to the target gravity for the new beer.

This same basic methodology also can be applied to determining a hop schedule. By looking back at previous recipes, an approximate extraction or kettle-utilization rate can be calculated that can be applied to the new batch. In this manner new hops with different alpha ratings or a different target-IBU range for the recipe easily can be approximated to minimize the guesswork that could lead to an over- or underhopped brew. These same procedures can be used when attempting to adapt a recipe from another source into your own brewing environment, where efficiency and utilization rates might be entirely different due to differences in the procedures,

ingredients, or equipment used.

Even the most intricately detailed brewing log or record will be entirely useless unless you take time to periodically look back and review the material recorded, preferably while tasting a sample of the batch in question. Continually review brewing logs and make notes regarding the flavor profiles and sensations on the beers, both good and bad. That will help you minimize errors in future brews while at the same time increasing the knowledge of what goes into the creation of a good beer. And the faster your brewing knowledge and skills increase, the sooner you can enjoy a homebrew that tastes even better than the one in your glass right now. ☺

John Oliver is a BJCP national judge who maintains and reviews extensive brewing logs as head brewer for BJ's Brewery in Brea, Calif.

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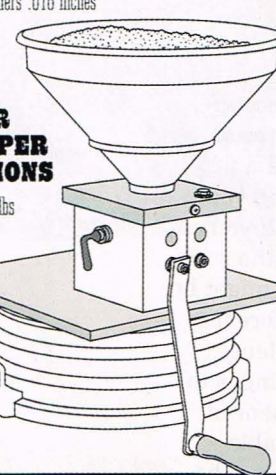
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Don't Do It!

8 Common Brewing Errors



Why: Moldy, musty, cheesy beer; poor fermentation.

Ingredients that aren't up to the task because they are no longer fresh or are of poor quality can ruin your beer. But it's easy to avoid this problem. Simply give your ingredients a visual inspection prior to brewing — and enough in advance to replace ingredients, if necessary. Grain that came in a holiday gift kit two years ago and has been stored in the basement might be a little moldy. Throw it out! (The canned malt is probably fine.) The yellow hops that came with the kit and the dried yeast you found in your utility drawer should be tossed as well.

Be sure to check grains, as well as dried malt extract and priming sugar, for signs of insect infestation. You're about to invest a good chunk of time in your brew; you owe it to yourself to use the freshest ingredients possible. Old grain can give beer a musty, moldy taste. Old hops can impart an unpleasant cheesiness to beer. The bugs are

self-explanatory. Old yeast means you have few or no live yeast cells. Fermentation will be weak, or it might not occur at all.

If you like to buy ingredients for several batches at once or prefer to buy in bulk, that's fine. Storing grain in a cool, dry place safe from vermin and refrigerating your hops and yeast will definitely prolong the life of your ingredients. It won't, however, make them immortal.



Why: Lack of body, fermentation problems, haziness.

Your brew day started a little later than you planned and you want to catch the early movie. If you cut your mash time and skip the recirculation entirely, you just might be able to make it. What difference could it possibly make? Plenty.

The purpose of mashing is to convert the starches present in malted barley to fermentable sugars and other materials. The

by Gretchen Schmidhausler

The right way

10t

MALT

SOAP



degradation of starch is facilitated by a variety of enzymes that work within specific temperature ranges.

Generally, a rest of at least one hour is recommended. This allows time for conversion and helps clear the wort. You need at least 20 minutes to give the grain bed a chance to establish itself. Without a good grain bed, the time you "saved" by shortchanging your mash will be lost twofold during an extremely difficult lauter. Also, taking the time to carefully draw off the sweet liquid and return it gently to the mash tun prior to lautering will help to clarify your wort.



Why: Chance of contamination,

poor hop utilization, haziness, lack of mouthfeel.

So you're still trying to make up for lost time. Why not just cut your boil time in half? The purpose of the boil is not just to mix the ingredients. A strong, vigorous boil serves a number of functions:

- Boiling stops enzyme activity, fixing the carbohydrate content of the wort. This determines the dextrin content of the final beer. Dextrins, in turn, contribute to the beer's body and mouthfeel.

- Proteins and tannins in the wort are precipitated out during the boil along with hop resins, forming a trub pile, also called the hot break. The removal of these coagulants from the wort prior to cooling aids in reducing or eliminating haziness in the finished beer.

- Hops contribute both aroma and bitterness to the finished beer. Boiling extracts both the bitter resins and aromatic oils from the hop. Finishing hops are added at the end of the boil to ensure that much of the aroma is not lost to

evaporation.

- Undesirable aromas, such as dimethyl sulphide (DMS), which gives beer a vegetable-like or creamed-corn character, are volatilized and driven off during the boil.

- Boiling also aids in color development, darkening the wort through the caramelization of sugars. It also encourages melanoidin production, which affects color and flavor.



Why: Fermentation lag, off-flavors.

You've taken some time to choose the right yeast for your beer. That said, treat it with the care and respect it deserves. If you're using liquid yeast, make sure to activate the packet at least 24 hours in advance and leave it in a warm (not hot) place. If you're relying on dried yeast, hydrate it in a sanitized container in warm water just prior to pitching.

Yeast should, of course, be pitched in the correct temperature range. (You should be familiar with your strain.) Too cold and you'll have trouble getting your fermentation off the ground, too hot and you might kill off the yeast cells. A too-high pitching temperature and fermentation can also result in an overly estery (fruity) beer and other off-flavors such as diacetyl (buttery).

Like all living things yeast need oxygen to survive, at least in the early stages of life. Aerating your wort at the beginning of fermentation is crucial to yeast metabolism. Yeast uses oxygen to produce flexible cell membranes that can transport nutrients. If oxygen is not provided, these membranes will be rigid and have difficulty carrying out their role. Depending on your brewing schedule, healthy yeast can



be re-used in your next batch.

Also, practice good sanitation whenever dealing with yeast.



Why: Off-flavors, especially esters.

It's been a textbook brew. Everything from the mash to the transfer went perfectly, and there are five gallons of beer resting comfortably in your sanitized fermenter. Now you can relax and let the yeast take over, right? Wrong! Now is not the time to get lazy. Fermentation needs to be supervised and controlled as much as any other aspect of brewing.

Beer is meant to be fermented at a certain temperature. This temperature varies depending on the yeast strain used and whether you are using a lager or ale yeast (60° to 72° F for ales; 45° to 55° F for lagers).

Actual fermentation temperature should be as close to the recommended temperature as possible, something not always easy to accomplish when brewing at home.

Unless you have a climate-controlled room or dedicated refrigerator for lagers, you'll have to do your best. If fermentation hasn't started in 24 hours, move your ale out of that cold basement. If it starts out going gangbusters, check to see if the heating vent you've placed it over is making it too warm. If you're going to take a gravity reading faithfully, you might as well do a daily temperature check on your sample.

If storage options are limited, try to be as ingenious as possible. Wrap a blanket around (and under) your fermenter and move it away from drafts in the winter months. Leave it in a cool closet or basement during the hot weather.

Fermenting at too high temperatures causes the yeast to work overtime, resulting in a very estery beer that tastes something like bananas, pears, or solvent. Or it might cause a harsh, bitter taste. Too low temperatures, on the other hand, often result in a meaty, brothy taste. This is due to the beer sitting on yeast that has dropped out of suspension.



Why: Undesirable flavors, gushing, haze, lack of body.

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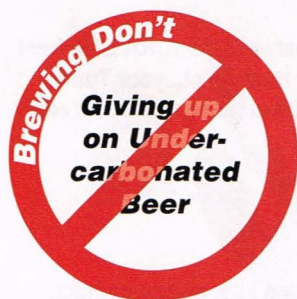
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but yes, proper sanitization makes all the difference in the world to your finished beer. Think of all the time and money you've invested in your hobby. Why wouldn't you take a few minutes to make sure your home brewery is sanitized? Although all your equipment should be clean, sanitization is most important after the boil. Anything that comes in contact with your brew as it begins to cool, hands included, must be sanitized. Be sure to sanitize the spoon you use to whirlpool, the wort chiller, the fermenter, stopper, and airlock, sampling device, bottles and bottle caps, and anything else you can think of that touches the beer.

A commercial sanitizer, mild bleach solution, or hot water (at least 180° F for 15 minutes, lower temperatures for some plastic items such as airlocks) will do the trick. Be sure to rinse well, if the sanitizer you use requires it. It's especially important to rinse bleach, because bleach residue can give beer a medicinal flavor.

Two common off-flavors produced by bacteria are associated with poor sanitization. Sourness is due to the bacteria *Lactobacillus* and *Acetobacter*, which produce lactic and acetic acids respectively. A buttery taste is caused by *Pediococcus*. While the bacteria responsible won't hurt you, it will ruin your beer. Bacterial contamination can also result in lack of body, gushing, and haze.



Why: Problem is probably correctable.

The beer's been bottled for the prerequisite two weeks and you just can't wait any longer. You chill it and, mug in hand, pop open a bottle with great anticipation. Oh, no!

Where's that tell-tale "ssst"? Undaunted, you pour the beer into the glass, refusing to notice the lack of any head formation. Do you pour two cases of hand-crafted beer down the drain?

Certainly not. It's way too early to give up on this batch. First, just how cold was that beer? Did you chill the mug? Ice cold beer is less effervescent than slightly warmer beer. If you had a little "ssst" but not the pronounced sound you're used to — in other words the beer's not totally flat — temperature might be part of the problem.

Has your beer been stored cold? For carbonation to take place, beer needs to be conditioned at room temperature. The back of your closet is fine. The corner of your basement in the dead of winter is not.

During conditioning, the remaining yeast in your beer produces carbon dioxide by consuming whatever medium you used for priming: sugar, honey, or dry malt extract. As with fermentation, if the beer is too cold, yeast will drop out of suspension and be prevented from doing its job.

In the case of too cold temperature, move your beer to a warmer location for another week or two. You might also want to get that sleepy yeast back into suspension. Quickly invert each bottle (don't shake) and replace it in the case.

If you're confident your beer has been conditioned at the right temperature, the solution might be as simple as putting the bottles away for another week or so. So another week goes by and there's been no improvement. Ask yourself this question: Did I remember to add priming sugar?

Don't panic. There are still a few tricks you can try. It's a hassle and you risk contaminating your beer, but you can uncup your bottles, add another small dose of priming sugar or a few grains of dried yeast.

Your last option is to blend the flat beer with one of your more successful brews.



Why: Poor representation of style, lack of body.

The great thing about homebrewing is that it can be a relatively inexpensive hobby. Still, some homebrewers seem determined to spend as little as possible on their beers.

You can certainly make some good, light-bodied beers using a minimum of malt and dried yeast, but to imitate a particular style or favorite brand, you have to spring for the right ingredients. Take liquid yeast, for example. Sure, you can brew a generic ale or lager using dried yeast. But to create an authentic hefeweizen, Irish stout, or Belgian ale, you need a specific yeast.

It also pays to invest in the right equipment — a good brewpot, for example. Stainless steel is definitely preferred over cheaper aluminum and enamel pots. Aluminum pots are generally thinner and will often scorch on the bottom, caramelizing wort in the process. Aluminum can also impart off-flavors. Enamel has the same tendency to burn on the bottom, and it also can chip, leading to problems with sanitization. For large batches, a converted keg is ideal as a brewpot.

Another must for a brewer who makes large batches is a wort chiller. It's an investment you won't regret.

Also, don't assume plastic components such as tubing, airlocks, bottling tips, buckets, and the like will last forever. Replace them when they begin to get yellowed, scratched, and cracked. They represent a small investment. 

Gretchen Schmidhausler is site brewer for Basil T's Brewpub and Italian Grill in Toms River, N.J. She is a graduate of the American Brewers Guild.

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4 Great Beers You Can't Buy — But Now You Can Brew

We in the United States are very fortunate to be able to get such a wide variety of beer styles. The microbrewing revolution, multi-tap alehouses, and public demand for imports have all contributed to the beer selections we enjoy.

But there are still thousands of beers that are unavailable here. Maybe that's why pilgrimages to the great brewing centers of the world are so special. But you can't travel all of the time. For those times when you crave something new but can't catch the Concorde to go find it, here are recipes for four great beers you can't buy in the United States.

Banks's Mild Ale

Mild ale is a light brown, sometimes slightly sweet ale with subtle chocolate flavors and a light body. It is brewed primarily in the English Midlands area known as Black Country. Banks's and its darker companion ale, Hanson's, are brewed by Wolverhampton and Dudley in the town of Wolverhampton, located in the middle of this territory.

Banks's is pretty typical as far as mild ales go. It is light and balanced with toasted grain hints and a slight chocolate finish. Mild is often thought to be simply the draft version of a brown ale, but this really is not very accurate. Mild ale is not on the whole a brown ale by style. There

are significant differences in the gravity, bitterness, and grain bill, particularly in the specialty grains.

Banks's is an extremely simple formula that does not use any dark or dextrin malts. Rather, the grain bill is comprised of a simple pale malted barley base supplemented with pale crystal malt for color and flavor and flaked barley for body. It also contains sugar as a source of fermentables, which is very common in the mild style category. The target original gravity is 1.034 (8.5° Plato) with a terminal gravity of 1.008 (2° Plato). Alcohol by volume is about 3.3 percent.

Hopping is done in one Fuggle addition at the beginning of the boil to achieve a subtle bitterness of 22 IBUs.

Fermentation is typical, 68° F using an English ale or London ale strain. Conditioning takes about seven days. Proper carbonation for mild ales is around 1 volume of CO₂, less than half of the standard for many U.S., German, and Belgian beers. This low standard of carbonation gives the beer a fuller, maltier, more "cask conditioned" flavor.

Banks's Mild Ale (5 gallons, all-grain)

Ingredients:

- 4 lbs. pale Munich malt

by Mikoli Weaver

- 0.5 lb. flaked barley (pre-gelatinized)
- 0.5 lb. crystal malt, 40° Lovibond
- 0.5 lb. light brown sugar
- 1 oz. Fuggle hops (4.2% alpha acid, 4.2 AAUs) for 90 min.
- 1 pt. starter of Wyeast 1318 (London III) or similar
- 1/4 cup corn sugar for priming

Step by Step:

Mash grain in 1.5 gal. of 150° F water for 60 min. Sparge with 168° to 170° F water to collect 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil, add the Fuggle hops and boil 90 min. Whirlpool and cool to 68° F to pitch starter. Oxygenate/aerate well.

Ferment for seven days at 68° F, then rack to secondary fermenter. Continue for seven more or until fermentation is done or gravity is about 1.008 (2° Plato). Prime and bottle. Allow to carbonate. Age at least seven more days before drinking.

Extract Version

Substitute 4 lbs. extract syrup for the pale malt and increase Fuggle hops to 1.25 oz.

Start with 5 gal. of 150° F water. Steep crushed grain for 30 min. Sparge grains with enough 170° F water to make 5.5 gal.

Heat to boiling and add extract syrup. Total boil will be 60 min. At beginning of boil add Fuggles, continue for full 60 min., and whirlpool. Cool to 68° F and pitch starter. Oxygenate/aerate well.

Ferment as above.

OG = 1.034 (8.5° Plato)

Bitterness = 22 IBUs

Color = 8° SRM

3.3% ABV

Arrol's 80 Shilling Ale

When a brewer thinks of Scotland, Edinburgh and Scottish ales are likely the visions. Also, the tiny, box-like pubs that line the streets and alleyways, and the warm wooden atmospheres inside them. Arrol's 80 Shilling is a beer that evokes these images. It leaves a lasting impression of character and

Scottish heritage.

The shilling title is a designation of strength in Scottish ales. The monetary connection started as a symbol of taxation; British breweries are taxed by original gravities. So 80-shilling (80/-) ale is another name for the Scottish "export" category. The guidelines for the style are original gravity 1.040 to 1.050 (10° to 12.5° Plato), alcohol by volume 4 percent to 4.5 percent, bitterness 15 to 25 IBUs, and color 10° to 19° SRM.

Arrol's 80 Shilling is a traditional 80-shilling Scottish ale brewed in Edinburgh for the local markets. It serves as the house beer for several pubs, both free and tied houses (those owned by the brewery).

The Arrol's line is now brewed under contract at Caledonian, Edinburgh's largest brewery. This arrangement is a result of the major downsizing a couple of years ago by the beverage conglomerate Carlsberg-Tetley. Three of its five breweries were axed, including Alloa, which produced the Arrol's beers. The arrangement affected production and distribution somewhat, but the beer is still readily available.

Arrol's 80 Shilling is made with pale, crystal, and brown malts in a single step to achieve an original gravity of 1.048 (12° Plato). The beer finishes at 1.014 (3.5° Plato) and has an alcohol content of 4.3 percent by volume. It uses Fuggle hops for bittering and Kent Goldings for flavor and aroma. Fermentation will be done here with Wyeast 1728 (Scottish ale) for two weeks and bottle conditioning for another week.

Arrol's 80/- Scottish Ale (5 gallons, all-grain)

Ingredients:

- 5 lbs. British pale malt
- 0.5 lb. carapils or dextrin-type malt
- 1 lb. crystal malt, 40° Lovibond
- 0.5 lb. brown malt or pale chocolate malt
- 1 oz. Fuggle hops (4.2% alpha acid, 4.2 AAUs) for 90 min.

- 0.5 oz. Kent Golding hops (5.4% alpha acid, 2.7 AAUs) for 30 min.
- 1 pt. starter of Wyeast 1728 (Scottish ale)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 2.25 gal. of 150° F water for 90 min. Sparge with 168° to 170° F water to collect 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil, add Fuggle hops and boil 60 min. Add Kent Goldings and boil 30 min. more. Whirlpool and cool to 68° F to pitch yeast starter. Aerate/oxygenate well.

Ferment at 68° F for seven days, then rack to secondary fermenter and continue for seven more days or until fermentation is done or gravity is about 1.014 (3.5° Plato). Prime, bottle, and age for seven more days.

Extract Version

Replace pale malt with 5 lbs. of pale malt extract and increase the Fuggle addition to 1.25 oz. Start with 5 gal. of 150° F water, and steep grain for 30 min. Sparge with enough 168° to 170° F water to collect 5.5 gal. of wort.

Heat to boiling and add extract. Total boil time is 60 min. At beginning of boil, add Fuggles and boil 30 min. Add Kent Goldings and boil remaining 30 min. Whirlpool and cool to 68° F to pitch starter. Aerate/oxygenate well.

Ferment as above.

OG = 1.044 (11° Plato)

Bitterness = 22 IBUs

Color = 14° SRM

4.3 ABV%

Kaiserdorn Meranier Schwarzbier

Kaiserdorn is one of the Great Bavarian lager breweries whose exports make the U.S. market. It is perhaps best known for its smoked beers (rauchbiers) in which smoked malts are used in the mash.

The Meranier Schwarzbier is a German black beer with the Kaiserdorn twist of a slight amount of beechwood smoked malt in the

grain bill. This adds a complexity and depth to the flavor profile that sets it apart from the other beers of the style. This beer, though, is not produced for export.

The schwarzbier is not as smoky as the standard rauchbier in the Kaiserdom lineup and is balanced by a rich tapestry of dark malt flavors that harmonize with the smoked qualities. The malt is traditionally Bamberg, smoked with beechwood. Look for something like Weyermann Rauchmaltz. You can smoke your own malt at home using beech or other hardwoods such as apple and peach. Avoid using softer woods and those high in pine and pitch flavors. Peat-smoked malts also will do as a substitute when dealing with such small quantities. Hugh Baird 4.6 parts per million peated malt is a good choice.

The overall impression of the beer should be smooth and balanced with very subtle noble hop qualities. There should be no

bitterness, however. Roasted and dark grain flavors should be the finish, along with a smooth lager yeast character with no diacetyl (butterscotch flavor).

Kaiserdom Meranier Schwarzbier (5 gallons, all-grain)

Ingredients:

- 6.5 lbs. pale Munich malt, 10° Lovibond
- 0.5 lb. cara-Munich malt, 40° Lovibond
- 0.5 lb. carapils or dextrin-type malt
- 0.25 lb. black malt
- 0.25 lb. rauchmalt (beechwood smoked pale malt)
- 1.5 oz. Hallertauer hops (3.5% alpha acid, 5.3 AAUs): 1.25 oz. (4.4 AAUs) for 90 min., 0.25 oz. (0.9 AAUs) for 30 min.
- 2 pt. starter of Wyeast 2206 (Bavarian lager)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 3 gal. of water at 150° F for 60 min. Sparge with 168° to 170° F water to collect 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil, add 1.25 oz. Hallertauer hops and boil 60 min. Add 0.25 oz. Hallertauers and boil remaining 30 min. Whirlpool and cool to 45° F to pitch starter. Oxygenate/aerate well.

Ferment at 45° F for three days. Raise to 50° F for three days. Raise to 55° F. Rack to secondary when gravity reaches 1.020 (5° Plato), about three to seven more days. Cool to 40° F and ferment until 1.008 to 1.012 (2° to 3° Plato). Age at 40° F until cleared (about 14 days). Prime and bottle. Condition as long as desired.

Extract Version

Substitute 6 lbs. of pale German extract syrup for the Munich malt and increase the first Hallertauer



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addition to 1.5 oz.

Start with 5 gal. of 150° F water. Steep crushed specialty grains for 30 min. Sparge grains with enough 170° F water to make 5.5 gal.

Heat to boiling and add extract syrup. Total boil will be 60 min. At beginning of boil, add 1.5 oz. Hallertauer hops, continue for 30 min., and add 0.25 oz. hops. Boil for 30 min. more, then whirlpool. Cool to 45° F and pitch starter. Oxygenate/aerate well.

Ferment as above.

OG = 1.052 (13° Plato)

Bitterness = 22 IBUs

Color = 40° SRM

5% ABV

St. Landelin Abbey Blonde

France is not generally looked upon as a beer-producing country, nor are the French generally known as beer-drinking people. But the fact is that France is home to many

outstanding beers. The light lagers of Alsace, the Belgian-style biere de garde, and Flemish browns brewed in the Northlands called Flandres, and the Abbey ales of Paris and the North.

Oftentimes, though, these beers can be consumed only locally. The three Abbey ales of the St. Landelin Abbey, brewed by Brasserie Enfants de Gayant, were established in 1919. Particularly notable is the St. Landelin Blonde, a bright golden, crisp, and flavorful ale with distinct Saison qualities. The yeast character is earthy and Belgian in flavor with some underlying green apple and clove flavor. Belgian-style blondes and pales are some of the most satisfying beers in production worldwide. They are both full of flavor and refreshing at the same time. Aromatic, bright, vibrant, and very continental, they are unparalleled by other pale styles.

St. Landelin Blonde is made from a variety of all pale malts in a

step mash and 90-minute boil to give an original gravity of 1.060 (15° Plato), an alcohol of 5.9 percent by volume, and a color of 5° SRM. The brewery gives the bitterness at 40 IBUs from Perle hops for bittering and Hersbrucker hops for flavor and aroma in a typical two-stage hop schedule.

Due to the quality of malt worldwide, the step mash is really not necessary. You will not be using any raw rolled barley in the recipe, so a single infusion at 150° F will be fine. Fermentation is done a bit differently: four days at 75° F and one month at 34° F. The yeast you will use to emulate the yeast used by St. Landelin is Wyeast 1214 (Belgian ale). This beer is highly carbonated, but because the beer will be bottled at about 1.014, only one-third cup priming sugar will be used to avoid exploding bottles and completely unpourable beer.

This beer is great with food, as are all Belgian and Belgian-style

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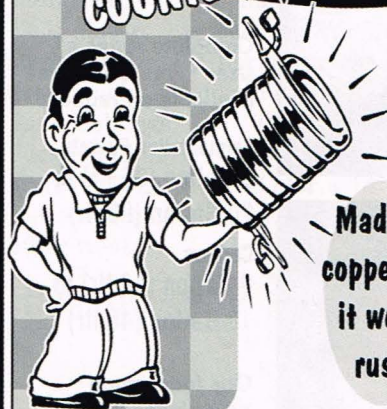
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beers. Best pairing is with first courses such as mussels, shrimp, boursin cheese, salads with fruit vinaigrette, roasted garlic, and crusty breads.

St. Landelin Abbey Blonde (5 gallons, all-grain)

Ingredients:

- 5 lbs. pale Belgian aromatic malt
- 3.5 lbs. pale pilsner malt
- 0.5 lb. pre-gelatinized flaked barley
- 1 oz. Perle hops (8% alpha acid, 8 AAUs) 90 min.
- 0.5 oz. Hersbrucker hops (4% alpha acid, 2 AAUs) at end of boil
- 1 pt. starter of Wyeast 1214 (Belgian ale)
- 1/3 cup corn sugar for priming

Step by Step:

Mash grain in 3 gal. of 150° F water for 60 min. Sparge with enough 168° to 170° F water to collect 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil, add the Perle hops and boil 90 min. At end of boil, add the Hersbrucker. Whirlpool and cool to 75° F to pitch starter. Oxygenate/aerate well.

Ferment at 75° F for four days, then rack to secondary fermenter and continue fermenting at 34° F for four more weeks or until fermentation is done or gravity is about 1.014 (3.5° Plato). Prime and bottle.

Extract Version

Substitute 7 lbs. English dry malt extract for the pale malts and increase the Perle addition to 1.25 oz.

Start with 5.5 gal. of water. Heat to boiling and add extract syrup. Total boil will be 60 min. At beginning of boil, add Perle hops and boil 60 min. At end of boil, add Hersbrucker hops and whirlpool. Cool to 75° F and pitch starter. Oxygenate/aerate well.

Ferment as above.
OG = 1.058 (14.5° Plato)
Bitterness = 35 IBUs
Color = 5° SRM
5.9% ABV

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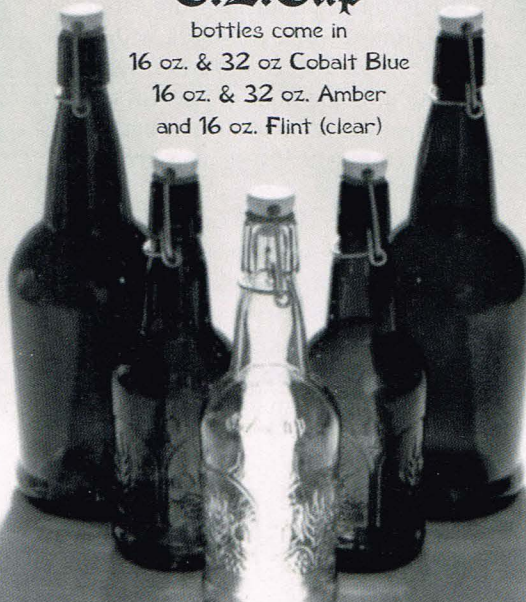
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High-Gravity Brewing FOR ALL-GRAIN BREWERS

Here's a dumb question: Would you like to brew more beer? Of course you would. But you can't because you've only got a five-gallon brewery, right? Actually, there is a way to brew more beer using only your existing equipment. It's called high-gravity brewing.

Basically, you make a concentrated wort early in the brewing process and dilute it to working strength later. Your brewing setup determines when you work with a concentrated wort and when you dilute it. Using high-gravity brewing, you can get an extra dozen bottles or more from your five-gallon brewery.

Boiling a Concentrated Wort

For many homebrewers, the kettle is the limiting piece of equipment. You can spend as much on a new, larger pot as you did on your entire starter brewery. If you're still brewing with a small kettle but have

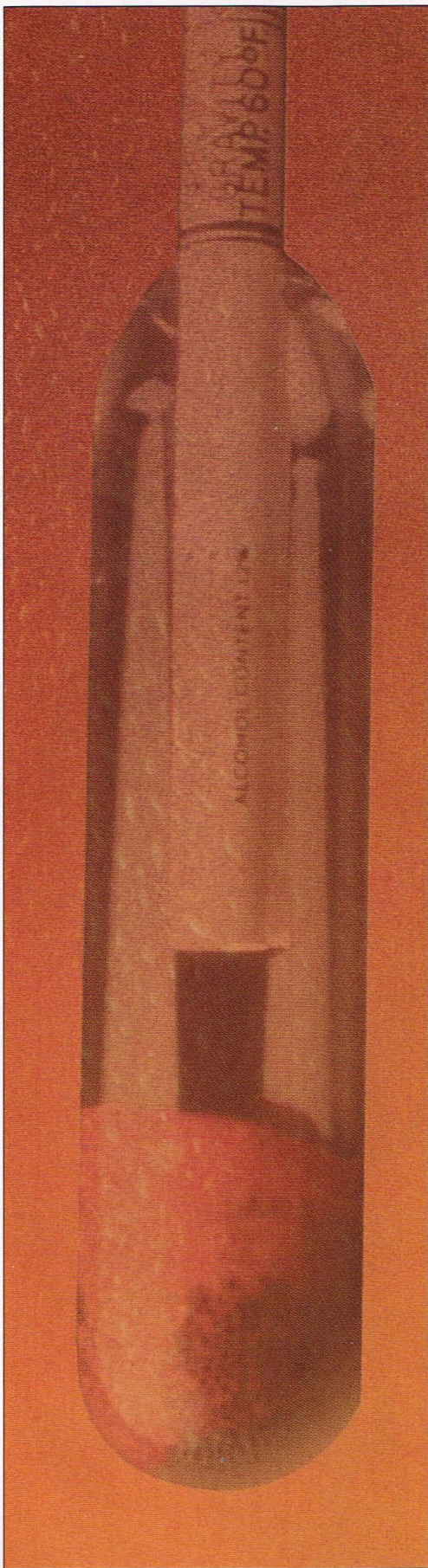
an extra fermenter or two, you can get around this bottleneck. Just boil a concentrated wort and dilute it into two fermenters. There are three steps to doing this: collecting a concentrated wort, boiling this wort, and diluting it to working strength in your fermenters.

Collecting a Concentrated Wort

If you are an extract brewer, you probably are boiling a concentrated wort already. Most introductory brewing books recommend boiling the required malt extract in a few gallons of water. This wort is added to a couple gallons of cold water in the fermenter. There are advantages and disadvantages to this. Boiling a concentrated wort makes wort chilling easier or unnecessary; you just add cold water. However, you need to add more hops to get the same amount of bitterness as you would from a full-wort boil.

by Chris Colby





Making a concentrated extract wort is easy; you simply add more malt extract. Collecting an all-grain wort is a little more difficult if the gravity is more than 1.065 or so. To collect a wort of this gravity, you need to think barleywine production; use more malt and less sparge water.

Begin collecting the concentrated wort by mashing the grains, conducting the initial run-off, and sparging as usual. However, when you approach the target volume, stop adding sparge water and run the mash tun dry as you collect the final runnings. This might take a few tries to get right, so take careful notes each time you brew. A good book on barleywine production will help with this step.

The downside to low-sparge mashing is that all the sugars do not get rinsed from the grain. If you collect more than two gallons after you quit sparging, you'll need to add some grain to the mash to compensate for this.

Barleywine brewers concentrate their worts further by reducing the volume with an extended boil. This isn't applicable here since it requires a larger kettle. If you had a larger kettle, you wouldn't be brewing this way. Once the wort is collected, you're ready to boil.

Boiling a Concentrated Wort

Boil a concentrated wort the same way you boil a regular wort. However, you need to make two adjustments at recipe formulation.

Hop utilization decreases with increasing wort gravity. So to maintain the desired level of bitterness in your beer, you need to adjust your hop additions. You can do this by adding more hops, using hops with a higher alpha-acid content, or by boiling your hops longer.

In addition high-gravity worts darken more during the boil than lower gravity worts. To counteract this you might want to decrease the amount or color rating of the specialty grains. Do not boil the wort for less time or with less vigor. A prolonged, vigorous boil is necessary to obtain a good hot break.

Decreased hop utilization is a bigger problem than wort darkening for all but the lightest beers. Check a hop-utilization chart for how to adjust your hop additions for different gravities. Basically, hop utilization stays roughly the same for all gravities less than 1.050. More than 1.050 you should add 10 percent more hop bitterness for every 15 points in gravity.

To adjust the amount of specialty grains, especially mixtures of specialty grains, you'll need to experiment. Start by reducing the amount of your lightest colored grain. Avoid caramelization caused by scorched sugars. Once you finish boiling the wort, you are ready to dilute it to working strength.

Diluting a Wort at Fermentation

To dilute the wort to working strength, add preboiled, cold, aerated water to the fermenter(s). If you chill the water in plastic food-storage containers, you can aerate the water by shaking the containers vigorously. Cold water holds more dissolved oxygen than warm water, so this water will help you reach your oxygenation goal faster.

Once the wort has been added to the water, your beer is at normal, working strength and requires no extra attention. Finish brewing as you normally would.

Gravity at Boiling

There is a tradeoff to consider when determining the boil gravity. The more concentrated your wort is, the more beer you'll get upon dilution. However, the problems of boiling at a higher gravity also will be more pronounced.

You can boil worts as thick as you'd like, but a reasonable range to shoot for is 1.070 to 1.100. At the lower end of this range, you will have no appreciable problems with wort darkening, and you'll only need to boost the hop bitterness slightly to compensate for the decrease in hop utilization. The upper end of the range is in barleywine territory. Here you will need to add significantly more hops, and the wort will darken noticeably during boiling.

Brew Planning and Example

So how would this work in practice? Here's an example for a homebrewer with a five-gallon brewery and a few empty carboys.

First, choose a five-gallon beer recipe and note the original gravity. Next, decide on the final wort gravity at the end of the boil. Call this boil gravity. For the example, say you choose to brew a pale ale, original gravity 1.048. You decide the boil gravity will be 1.070, in the strong- or old-ale range. Divide the boil gravity (70) by the original gravity (48). Drop the leading 1 and the decimal point when doing these calculations; 1.048 becomes 48, and 1.070 becomes 70. This is the expansion factor, the degree to which the wort will be "inflated" when you dilute it. The expansion factor will always be a number greater than one. In the example it's 1.46.

To determine how much fermenter space this beer will require, multiply the concentrated wort volume by the expansion factor. In the example you have five gallons of wort times 1.46, or 7.3 gallons of working-strength wort to ferment.

To formulate an "expanded" recipe, multiply the quantity of each ingredient in your five-gallon recipe by the expansion factor. Then, increase the amount of hop bitterness to account for the loss in hop utilization. In the example you need to add 15 percent more bittering units. Then, if desired, decrease the amount or darkness of the specialty grains.

To collect the wort, begin mashing as usual. When handling more grain, a heavy mash spoon really helps. Collect enough wort to have five gallons at the end of boil. To reach a gravity of 1.070, you might want to shut off the sparge water when you have about a gallon of wort left to collect. Boil the wort as usual.

To dilute the wort take your cold water out of the fridge and give it a good shake to aerate it. Add this cold, aerated water to the fermenters. In the example a total of

2.25 gallons of water would be added (divided among the fermenters). Chill your concentrated wort and siphon it into the fermenters to make 7.3 gallons of

Running a good fermentation is the most important consideration when brewing a high-gravity batch.

working-strength wort. Remember that you won't have to cool the wort all the way to pitching temperature.

The cold water in the fermenters will drop the temperature further.

The wort is now at your intended original gravity. Treat it as you normally would. Aerate the wort, remembering that the cold water has given you a little head start here. Pitch your yeast, ferment, package, and enjoy as usual. Finally, when you're down to the last case of bottles, smile. You'd be out of beer if you brewed it the normal way.

Fermenting a Concentrated Wort

If both the kettle and your fermenter are limiting factors, you can brew a concentrated beer and dilute it at packaging. In fact all the major commercial breweries in the United States use high-gravity fermentations. There are three steps to doing this: collecting and boiling a concentrated wort, fermenting this wort, and diluting it at packaging.



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Fermenting a Concentrated Wort

Fermenting a concentrated wort creates the following problems: elevated production of esters (fruity or solvent-like flavors), increased yeast demand for oxygen, decreased head retention, and extended fermentation time. The first three can be dealt with by running a good fermentation. The last one just needs to be accepted.

Running a good fermentation is the most important consideration when brewing a high-gravity batch. To run a good fermentation you need to pitch an appropriate amount of yeast, aerate the wort thoroughly, and keep the fermentation temperature in a suitable range.

As the gravity of any beer increases, the amount of yeast pitched should likewise go up. You need to build an adequate yeast starter, not only to keep the ester levels manageable but to ensure you achieve a decent final gravity.

It is also important to aerate the wort thoroughly. The yeast cells' demand for oxygen increases with wort gravity, but thicker worts hold less oxygen. As a consequence, you need to ensure the wort is saturated with as much air as it will hold.

Finally, ferment a few degrees below your normal fermentation temperature. High-gravity worts heat up faster, especially at high krausen (the peak of fermentation), so keep an eye on things early on.

Running a healthy fermentation keeps the esters at appropriate levels. Esters are volatile chemicals produced by the yeast. They are responsible for the "ale" smell. Selecting a clean yeast strain is also a must if you plan to ferment worts higher than 1.070 specific gravity or so.

Decreased head retention is caused by a high concentration of higher alcohols, a function of wort gravity. Running a good fermentation helps this as well. In addition

some adjustments at recipe formulation will help. Add a half-pound of wheat malt. Wheat malt contains proteins that aid in head retention. Once fermentation is complete, it's time to bottle or keg.

Diluting the Wort at Packaging

The most important thing to avoid when diluting the concentrated wort at packaging is introducing oxygen into your beer. To avoid introducing oxygen you should deaerate your dilution water, add a small charge of packaging yeast, and avoid splashing the wort as much as possible.

Oxygen in beer leads to staling, producing cardboard tastes that develop after the beer has matured for a while. Boiling the dilution water scrubs most of the oxygen out of the water. The dilution water should be cooled before adding it to the fermented beer.

Adding yeast serves two purposes. It scavenges any oxygen

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accidentally introduced during packaging. (Even if you force carbonate, adding some kegging yeast is a good idea.) And if you naturally carbonate your beer, the yeast used at fermentation will be "tired" from the high-gravity fermentation. Fresh yeast will be able to ferment the added sugar to carbonate your bottles or keg properly.

Gravity at Fermentation

What should your wort gravity be at the start of fermentation?

Well, barleywine brewers ferment worts up to 1.100 and beyond.

For most styles of beer, however, this would lead to unwanted fermentation characteristics in the finished beer. A reasonable target range is 1.065 to 1.075, depending on your ability to take care of the high-gravity brewing adjustments.

At the lower end of the range, you will need to make only slight brewing adjustments, and you probably won't notice the difference in

the finished beer. At the higher end of this range (and beyond), you will have to make sizable adjustments to your brewing procedure, and you will taste differences in your finished beer.

Brew Planning and Example

Okay, let's plan a brew. Say you are going to make your five-gallon pale ale recipe again, with an original gravity of 1.048. You choose to ferment the wort at a gravity of 1.060. Divide the fermentation gravity (60) by the intended original gravity (48) to get the expansion factor. In this case it's 1.25.

Multiply the boil volume (five gallons) times 1.25. In this case you get 6.25 gallons, the amount of beer you will have after your post-fermentation dilution. Then formulate the recipe as before, by multiplying each ingredient by the expansion factor and adjusting the hop additions.

Collect the wort and boil so that

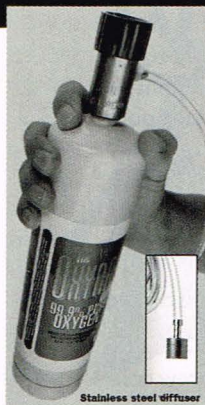
you end up with five gallons at 1.065. Cool and siphon this to the fermenter. Don't dilute at this stage, as in the previous example. Aerate well and pitch the yeast.

If you've built an adequate starter, it is probably a reasonable volume and more diluted than your wort. Don't dilute the concentrated wort by pitching the whole starter. Let the starter ferment to completion and pitch the yeast sediment only. You will experience an increased lag time before fermentation. However, if you aerate sufficiently and your sanitation is good, pitching only the slurry won't adversely affect your beer's quality.

Ferment your beer, paying special attention to the fermentation temperature. Once the beer is fermented, you are ready to bottle or keg.

Dilute the beer at packaging with room-temperature, deaerated water. In the example you need to add 1.25 gallons of water. Boil the

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water to deaerate it, then cool it to room temperature. Add the dilution water to the fermented wort in the bottling bucket with as little splashing as possible. Add the priming sugar and the bottling yeast. One smack pack of liquid yeast at packaging is more than enough for 10 gallons of beer.

Unless you have a gigantic bottling bucket, you will need to do this in shifts. Package and enjoy as usual. By fermenting a concentrated wort, you have an extra 12 beers to enjoy.

Suitable Styles for High-Gravity Brewing

You can brew any low- to moderate-gravity beer with these procedures. But if you are high-gravity brewing for the first time or you are planning to brew at the upper limits of the recommended ranges (or beyond), it pays to consider brewing styles that are least affected by high-gravity brewing.

The best styles for high-gravity brewing are darker, less hoppy ales. Porters and stouts, for example, are excellent choices. No one is going to notice a little extra color in these beers and you expect, even desire, a nice ale nose. Plus, you can easily — and economically — increase the amount of hop bitterness to overcome the deficit in utilization. Other suitable styles are copper-colored altbiers, dunkelweizens, brown ales, and mild ales.

Scottish ale is another good choice, especially if you add brown sugar to boost the gravity. However, be sure to pitch plenty of a very clean yeast, or your ester level will be out of range for a Scottish ale.

If all you brew are light-colored, clean but hoppy lagers, you still can practice high-gravity brewing. However, you'll need to stick to the lower end of the recommended gravity ranges and pay special attention to the compensating techniques.

You might have noticed that the recommended range for boiling a concentrated wort is higher than the recommended range for fermenting a wort. This might lead you to ask, "Can I boil a superconcentrated wort, dilute it to a merely concentrated wort for fermentation, then dilute to working strength at packaging?" You sure can.

One method that has been used for porter involves boiling as much wort as possible, in this case about eight gallons, at a gravity of 1.080. Then the wort is diluted to nine gallons at 1.070 for fermentation, filling a six-gallon and three-gallon fermenter. Finally, the wort is bottled in three shifts, diluting to three different gravities: 1.050, 1.055, and 1.060. This yields 10 three-fourths gallons.

If you try high-gravity brewing, have fun trying to push the limits of your system. But always keep in mind that six gallons of good beer is better than seven gallons of swill.



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Brewing: Controlling Color

by Randy Whisler

Brewers generally agree that color is an important sensory component of beer. But for many brewers, it's the component they know the least about. How do you control color? On the surface it seems obvious. If you want a dark beer, just use more dark grain in the recipe. However, there are many ways to create and control color and, more important, to create a color and flavor profile to fit the desired beer.

Color formation is influenced by every step of the beer-making process, from malting through fermentation and even into the finished product. The malting process has probably the most recognized influence on color and is the true start of the brewing process. When the barley has been

brought in from the field, dried, and sold to the maltster, the color process begins in earnest.

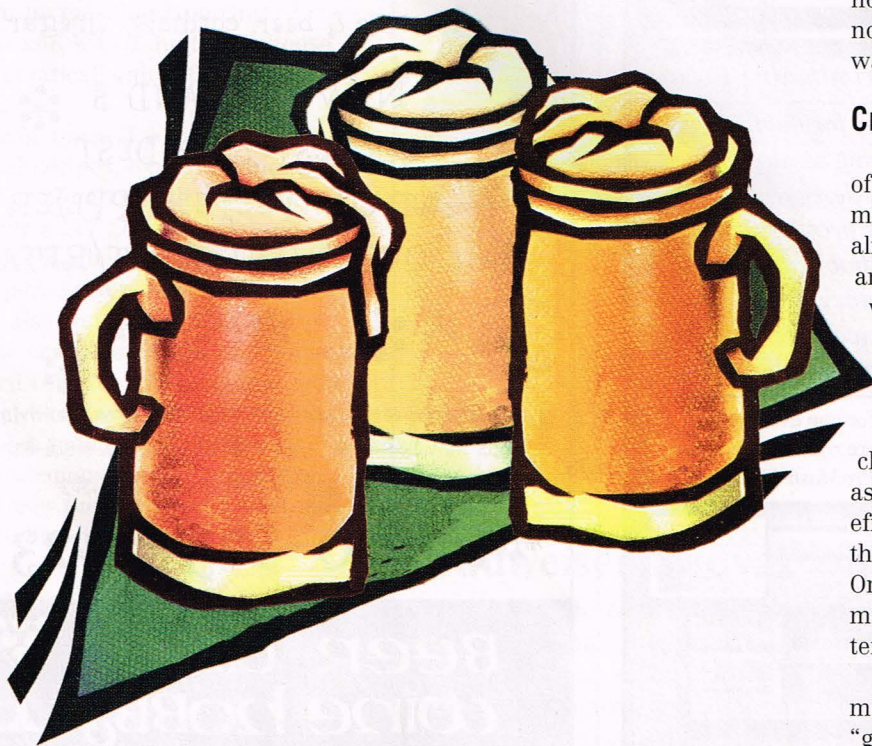
Most of the barley is destined to become plain old pale malt. However, even at this stage the barley is being selected for color formation. The barley grain that has less husk material and less protein tends to create a lighter colored malt in the end. In this case the barley for pale malt is being chosen on the ability to have low color formation, among several other factors.

Most of the rest of the malting barley becomes specialty malts, a category rapidly growing in diversity (See Selected Specialty Malts, page 44, for a few of the recognized specialty malts). There are, however, two major categories of specialty malts: crystal malts, and non-crystal malts. The distinction is not in their color but rather in the way they are processed.

Crystal Malts

Crystal malts are made using one of two methods. The first uses pale malts that have been fully processed already. The whole pale malt kernels are steeped in warm (150° to 170° F) water and are effectively mashed in the kernel. This reduces the starch contained in the grain to various sugar chains, mostly maltose. Several longer sugar chains also are left in the kernel, as the mashing process is not as effective in the kernel as it is when the kernel is broken and mixed. Once the mashing is finished, the malts are then rekilned at various temperatures.

The second method for crystal-malt production begins with moist "green" malt from the germination



floor. The green malt is stewed (heated without drying) to convert the starch to sugar and then kilned at various temperatures. The lower the temperature the less color formation occurs.

The color formation is brought

about by several factors, the most notable ones being the caramelization reactions and the Maillard reactions. Caramelization reactions cause color formation by reactions between sugars. Maillard reactions, the same phenomenon

that causes bread to brown when it's toasted, causes color formations by reactions with sugars and nitrogenous components, such as amino acids, peptides, and proteins. These reactions tend to give the malt a much richer malty aroma. Even though you can't actually perceive sweetness as a smell, these malts will make you think you can.

The colors that the crystal malts give can range from golden to nearly black. However, their most notable color function is the ability to give beers a red hue. This is one reason these malts are so prominent in the making of full-bodied ales, such as pale ales, red ales, and brown ales.

Non-Crystal Malts

Color from crystal malts is quite different from color formation caused by non-crystal malts. Non-crystal malts are not mashed and then rekilned. Their color is derived from their first and last kilning

Color Formation — What Affects Color

Malting Process

- Non-crystal malts: Gain color from first and last kilnings. The lower the kilning temperature, the lighter the color.
- Crystal malts: Affected by temperature of kilnings, but also derive color from caramelization reactions and Maillard reactions.

Mashing/Lautering

- Temperature and length of time: longer equals darker wort.
- PPO enzymes in malted barley

can brown wort in cooler mash (~150° F) and lauter (~160° F).

Boil

- Type of heat source.
- Vigor of boil.

Fermentation

- Type of yeast.

Post-Fermentation

- Oxidation.
- Heat: Pasteurization or improper storage.

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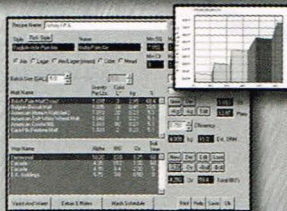


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process. As with the crystal malts, the lower the kilning temperature, the lighter the color. Non-crystal malts do not have much sugar in them to use for color reactions. Most of the color formation comes from the changes in the husk material and the starch itself. In effect the color is derived from the browning of the husk and/or starch. This does not create the perceived sweet smells but rather gives off-flavors ranging from bread-like to toasty to burnt and several flavors in between.

The color range of non-crystal malts is similar to that of the crystal malts, ranging from golden to black. However, for the most part non-crystal malts do not give off the red hues that are so prominent in the crystal malts.

Color and Mashing

The malting process is not the end of color formation. The mashing/lauding process also plays a role. Once a decision has been reached on what color a beer should be, the brewer must decide on the malts to be used in the recipe. There are several formulas that can be used for color. A simple one is listed on page 45 (Calculating Color Formation). What you do with the malt in the mashing/lauding process and which malt you choose can dramatically alter the color of your beer.

For instance if you made two identical recipes, except in one used a 20° Lovibond Munich malt and in the other a 20° Lovibond crystal malt, the two beers would have different perceived colors. The flavor profile also would be different, because crystal malt has much more Maillard reaction products that lend caramel-like flavors in comparison to Munich malt. Some of the compounds responsible for the aroma that causes the perceived sweetness of crystal malts include furans, pyrroles, and pyrazines.

The mash/lauder itself also contributes to the color formation of the beer. Both the time of the mash and the temperature of the mash play a role in the final color. All things being equal, a beer of a given recipe

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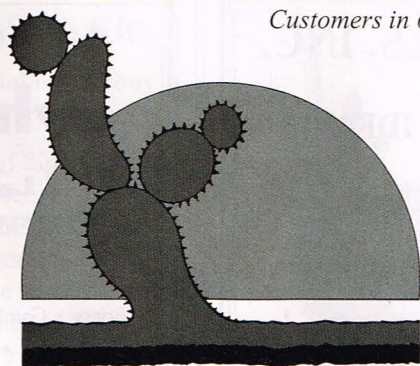
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that is mashed/lautered longer will be darker than one processed for a shorter time.

There is one scenario in which this does not always hold true, but it is the exception rather than the rule. There are enzymes in malted barley, especially in lightly kilned malt, that react with oxygen and tannins to cause brown color. They are called polyphenol oxidases (PPO). These are the same products that make apples, lettuce, acorns, and potatoes turn brown. They work with some polyphenol compounds and oxygen to polymerize the polyphenols together into large molecules. While this reaction goes relatively unnoticed in most brewing scenarios, it is possible to work actively to use this color formation.

To make PPO a factor in color, the brewer would start with a cool (149° to 152° F) mash, then keep the final lautur temperature low (160° to 165° F). The final step would be to mix the mash frequently and to

aerate the lautur. By doing all this you can make the wort slightly darker. There are many easier ways to achieve darkness. However, if you have ever pondered why you have made the same recipe with the same materials and one beer came out decidedly darker, PPO might have played a role.

Color and Boil, Fermentation

The wort boil also plays a role in color formation. Both the time and vigor of the boil play a role in coloring.

Another element that affects the color formation in a boil is the type of boil. For instance there is a marked color difference between an identical beer recipe brewed with a steam boiler or with a flame-fired kettle (or as one major brewery used to call it "fire brewed"). The beer brewed from an open-flame boil will be darker than one derived from a steam boil. Again this is because of a temperature

Selected Specialty Malts

Type	Color/Lovibond
Black Malt	475° to 525° L
Chocolate	325° to 375° L
Carapils	1.3° to 1.5° L
Carastan	40° to 50° L
Cara-Vienna	25° to 30° L
Crystal 10	8° to 12° L
Crystal 20	15° to 25° L
Crystal 40	35° to 45° L
Crystal 60	50° to 70° L
Crystal 80	70° to 90° L
Crystal 120	110° to 130° L
Dark Chocolate	400° to 450° L
Extra Special	120° to 140° L
Munich 10	8° to 12° L
Roasted Barley	275° to 325° L
Vienna	2.7° to 3.3° L

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difference.

The bottom of a gas-fired kettle is much hotter than the bottom of a steam-jacketed kettle. Most of the color reactions at this point are heat dependent, so the hotter the bottom of the kettle, the darker the beer will be. Of course with a gas-fired kettle, you also can burn the beer. This definitely gives color and flavor — not always a good thing. So if you have one of those 150,000 BTU Cajun Cookin' flame-throwers that are so popular for backyard brewing, consider turning down the flame a bit.

The vigor of the boil also affects the color. This functions in much the same way as added heat, because it is not really so much the heat that is driving the color reactions as it is the energy put into the system. More heat gives more energy to the system, as does a more vigorous boil.

There is a tremendous amount of energy released by the conversion

of water to steam and steam turning back into water. Chemists call this transition a phase change, and phase changes require a large energy input to happen. Along with more energy being in the system, the gas-liquid interface created by the boil — the surface of the bubble itself — creates a place where certain chemical reactions take place much more readily. The more vigorous the boil, the more bubbles per cubic inch. Therefore, there are more reaction sites available for color formation.

The fermenting process in general takes color away from the beer. The yeast cell is like most any other

cell found in nature in that the outside surface of it has many protein and glycoprotein structures sticking out of it. The structures have charges, either positive or negative. This allows an attraction to charged compounds in beer, including color compounds and bittering acids from hops.

Color and Oxidation

There can be color change in post-fermentation beer, also. Most of the changes are small, but color formation does take place. One factor that affects the color change is oxidation. Oxidation causes changes in many of the large

Calculating Color Formation

$(\text{Color Malt A} \times \text{Kilograms Malt A}) + (\text{Color Malt B} \times \text{Kilograms Malt B}) + (\text{Color Malt C} \times \text{Kilograms Malt C})$

Vol of wort (in liters)

1 Kilogram = 2.2 lbs., 1 gallon = 3.8 liters



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Brown Ale

Grain Bill

79% two-row, 1.3° to 2° L
8.5% Munich, 10° L
11.5% dark crystal, 80° L

Hops

Cascade Bittering
20 IBUs
Willamette Aroma

Here are five recipes used at Smuttynose Brewery, Portsmouth, N.H. The recipes demonstrate how grain bills are used to affect color and flavor profile.

The pale ale and the maibock are similar in color but are very different in their grain bill and flavor. In the pale ale the only specialty malt is 5 percent dark crystal. In the maibock specialty grains account for 21.5 percent of the grain bill, but only 1.5 percent is crystal malt. The maibock has four times the amount of specialty grain but is still the same color.

The flavor profiles are very different. With only 5 percent dark crystal the pale ale emits a sweet, malty aroma. The aroma of the maibock is definitely malty but lacks the sweetness found in the pale ale.

The brown ale and the Oktoberfest are also similar in color. Their grain bills call for a similar amount of specialty grains, 20 percent for the brown ale and 22 percent for the Oktoberfest. However, their proportion of crystal malts to non-crystal malts are almost reversed. The brown ale has more crystal than non-crystal malt. This gives the brown ale a more sweet malty flavor profile

Color in Recipe Formulation

and a red hue. The maibock has a big malty flavor but lacks the sweet overtones, and the beer is decidedly more brown than red.

The porter provides an example of the use of darker malts and subtlety. Looking at this beer, you might assume it is a stout. It is slightly darker than Guinness Stout, but if you look at the edge of the bottom of the glass you will notice that this beer has a red hue. If you were to taste it, you'd notice the lack of burned, bitter stout flavor that the color would otherwise lead you to believe is there.

The flavor profile is also semisweet and malty as opposed to many stouts that are on the more dry side. In other words a very dark color can be created without the use of roasted or burnt material. The key is to use a liberal amount of dark crystal and chocolate malts.

In the end only your imagination can limit the number of different grain bills that lead to the same color of beer, each with a different flavor profile. The joy of brewing should be to try new recipes and enjoy each of them for what they are.

Oktoberfest

Grain Bill

77.5% two-row, 1.3° to 2° L
15% Munich, 10° L
7.5% dark crystal, 80° L

Hops

Hallertaur Bittering
25 IBUs
Hallertaur Aroma

Porter

Grain Bill

74% two-row, 1.3° to 2° L
3.5% carastan, 50° L
7% dark crystal, 80° L
7.5% special B, 130° L
8% dark chocolate, 425° L

Hops

Cascade Bittering
43 IBUs
Cascade Aroma

Maibock

Grain Bill

79% pale malt, 1.3° to 2° L
3.5% caravienna, 30° L
8% carastan, 50° L
8% Munich, 10° L
1.5% dark crystal, 80° L

Hops

Hallertaur Bittering
35 IBUs
Hallertaur Aroma
Saaz Aroma

Pale Ale

Grain Bill

95% two-row, 1.3° to 2° L
5% dark crystal, 80° L

Hops

Cascade Bittering 40 IBUs
Willamette Aroma

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molecules in the beer. When these changes occur, they can cause an overall electrical charge change, a physical change in the molecules, or both. Either of these changes can allow the changed molecule to react with other molecules that they were not reactive with prior to oxidation. These reactions can cause an increase in color.

Another factor that can add color to the finished product is heat. Pasteurization can cause an increase in color, as can leaving the beer in the trunk of the car on a hot day. The mechanisms for this are the same as in the wort boil or the kilning process. An increase in temperature puts more energy in the beer and allows more browning reactions to take place. However, heating of finished beer and oxidation of finished beer are both bad for the beer in many other ways.

Light-Colored Beers

Creating color is one thing, but

what about the lighter colored beers — how do you keep color out of the beer? A few simple rules will go a long way toward reducing color in a finished beer.

First of all, avoid malt extract if possible. Extract already has been mashed, lautered, likely boiled, and heated in the drying process. With extracts you lose a lot of opportunities to control color.

To make a light beer use the lightest pale malt you can find. Along with light pale malt, you can also supplement the recipe with an adjunct such as rice or corn.

In the mash/lauter process, keep the temperature at 149° to 152° F for the mash and not above 170° F for the laut. Even though time is a factor for color, take the time to recirculate the laut until the *vorlauf* is clear. During the laut, try to keep aeration to a minimum.

For the boiling process the color formation will be greatly reduced by using a steam boiler or a double

boiler (the kettle of wort placed in a kettle of boiling water). This part is often impractical for the homebrewer, not to mention more dangerous, so make your own decision on this one. Keep the boiling time to a minimum. One hour is a generally established minimum. Cool the finished wort as quickly as possible. Keep oxidation to a minimum.

Let the fermentation run to completion, then condition the fermenter at as cold a temperature as you can for as long as possible. More than a month is overkill.

Finally, bottle with as little air introduction as possible. Store the beer in a cool place after the carbonation process has been completed. ■

Randy Whisler is the general manager and executive brewer for Smuttynose Brewery in New Hampshire. He holds a master's degree in brewing and food science from University of California, Davis.



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CIRCLE 6 ON READER SERVICE CARD

Top Five Household Gadgets

by Alison Crowe

Most winemakers like to be informed about their equipment choices. Too bad that most winemaking books only give out the basics. You know: carboys, fermentation locks, pH kits, and the like. It's up to you to figure out the rest of the stuff you'll need to make wine in the real world.

Even if a kit tells you all you need is a five-gallon bucket and a little yeast, there's really a lot more to the story than that. Below are some favorite tools that are indirectly related to winemaking.

Duct Tape

All right, this one is a gimme. Anyone who doesn't already have duct tape just needs to go out and buy some — now. Aside from myriad other household, automotive, and decorative uses, this super-sticky super-durable tape definitely has its place in the tool chest of every home winemaker.

Use duct tape to create labels for carboys. Write on a piece of tape with a permanent pen and you've got a quick, cheap label that can be taken off and stuck on a new carboy after you've racked the old one. Make the patch of duct tape big enough and you've got room to write the dates you racked it, the type of malolactic bacteria you added, the yeast strain you used — all for a few cents and a few seconds of your time.

The same works for barrels. Instead of writing on them with ugly chalk or permanent paint or marker, make a duct-tape label and stick it on one of the metal hoops of the barrel. You've got some easily read data that hasn't cost you the undeniable aesthetics of an unmarked barrel.

Of course duct tape is also great for fixing things. If your filter mechanism blows a hose, patch it up with, what else, duct tape! It's great for quick-fixing small leaks. No electrical tape? No problem. Splicing frayed or broken cords on pH meters, scales, or pumps is easy with duct tape, especially during the busy harvest season or over a weekend when you might not have time to call the repair person.

You can think up a ton of other uses for duct tape or even have your own favorite duct-tape trick. To be sure, those who can't or don't should go out and get some. You'll soon find, as many have, that duct tape is just like the Force; it's got a light side and a dark side, and it holds the world together.

Maglites

Everyone probably has a flashlight or two around the house. Except these aren't even in the same species group as Maglites, a trademarked name. Maglites are sturdy, metal, bright little suckers, and those that are about 8 inches long and skinny enough to grip between your teeth are practically standard for winery use. Just about every winemaker in the industry owns at least one and carries it with him in a back pocket or in a belt holster.

They're practically indispensable at so many stages in the winemaking process. Use them for peeking into dark barrels, checking siphon lines for clarity (lets you know when you've hit the lees), discerning if there are any bubbles in a glass of Chardonnay, or for detecting the presence of film yeast in your barrel or carboy headspace. Shine your Maglite through any liquid and you've got an immediate

— and well lit — idea of what's going on with it.

Decorate your Maglite with a few wraps of duct tape on the end and you've got a small pad that you'll appreciate when you clamp the flashlight in your teeth while filling a barrel, racking a large fermenter, or finding your way through a dark cellar with your hands full.

Here's another favorite Maglite winemaking trick. To estimate the amount of lees left at the bottom of an opaque fermenter after racking most of it off, slowly lower the Maglite vertically into the liquid, lens-end first. Continue holding it straight up-and-down and note how the light gets slowly dimmer with the distance and then goes out entirely.

The light went out when the lens hit the lees; the cloudy lees won't transmit light like clear wine will and so lets you know, by looking at the mark left by the

liquid on your Maglite, how many inches of lees you've really got at the bottom. This trick is only possible because, like so few flashlights out there on the market, Maglites are highly water resistant, a definite plus for winemakers.

Parafilm

Parafilm, standard university and professional laboratory issue, is clear, flexible, moldable, and stretchable and is usually used to seal small containers. It comes in 5-inch-wide sheets that are in rolls about 6 inches in diameter, is dispensed out of an enclosing cardboard container, and can be cut to any length you might require.

Parafilm is particularly useful as a quick closure for bottles, carboys, kegs, and the like. Because it is dispensed off a roll and cut and peeled from a paper backing, it is clean enough to do the job and isn't half as annoying as finding,

cleaning, and inserting bungs, corks, and their ilk. It's also helpful when mixing small amounts of reagents or wine additives in a closed container, say a 375-mL bottle. Simply cut about 2 inches of Parafilm off the roll, put it on top of the bottle, put your thumb over that, and invert. It's cleaner than your thumb, makes a watertight seal, and precludes the necessity of searching for the screw-cap to the bottle.

Though Parafilm does deteriorate with repeated handling and will bulge and eventually tear if stretched over the mouth of an actively fermenting carboy, it's still a great tool to add to your wine-making arsenal.

Digital Meat Thermometer

You probably already have a few thermometers scattered here and there around your home winery. Temperature is a critical parameter that winemakers always



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need to master. By the time one of the old-fashioned mercury thermometers gets up to speed, seconds of valuable time have been wasted and the solution you're measuring, say hot water for a yeast inoculation, might have lost critical amounts of heat already. Add that to the fact that poisonous mercury should never be used near winemaking; glass has a nasty habit of breaking, and many digital thermometers aren't waterproof.

Hand-held, digital meat thermometers are accurate, cheap, and water-tight, and they read almost instantly. Check barbecue supply shops, professional/gourmet cooking stores, and catalogs for product information. Buy a model that you can easily fit in your pocket and that has a long-life battery (some don't need replacing for up to three years). You might not use your old-fashioned thermometers ever again.

Microwave

This one is a favorite. Though some winemakers love the crisp snap of a piece of unrolling duct tape in the morning and yearn to get their fingers around a supple, stretchy, satisfying strip of Parafilm, using a microwave is about as creative as it comes.

Need to sterilize five screw caps? Use your microwave and a clean coffee cup to heat a half-cup of water to boiling and dump the caps in to soak for a few minutes.

Have four gallons of wine you need to heat to 72° F before you can dump in your malolactic culture? Nuke about half a gallon of it on high for two or three minutes and stir back into the cold wine in the carboy. Test the temperature with your digital thermometer and you're probably just about there.

Need to send a sample of stuck wine to a lab to have it analyzed for residual glucose and fructose but

are worried about it fermenting in the bottle on the way? Microwave your sample to about 140° F and ship it without worry. The high heat and the microwaves themselves effectively pasteurize the wine, leaving it safe to seal into closed containers.

Be aware, however, that microwaving wine is a lot like cooking it on a stovetop. Don't plan on treating large amounts of it in this way or you'll risk getting a lot of oxidized flavors and aromas in your finished product.

If you're sending samples in for analysis of ethanol, volatile acidity, or anything else that might be affected by high heat or boiling, it's still best to freeze your samples to inactivate microorganisms. ■

Alison Crowe is a University of California, Davis, Department of Viticulture & Enology graduate currently making wine commercially in the Santa Cruz (Calif.) mountains.

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A Crushing Event: Ciderfest '99

by Naida Grunden

Like most clubs, the Three Rivers Alliance for Serious Homebrewers (TRASH) concentrates on the brewing of beer. However, wort isn't the only substance that ferments; apple juice does, too. While still a novice brewer, my husband, Larry, discovered that making cider was easy, not intimidating — in short, an excellent place for a beginner to start.

Now, Western Pennsylvania in fall is apple nirvana. Three apple orchards thrive within a couple of miles of our house, producing about 30 varieties. Just 10 miles north of us is the euphoniously named hamlet of Zelienople. There, Sally's Cider Press, a 100-year-old marvel, squeezes out the purest apple juice.

Six years ago, the idea struck Larry: I'll bet back when Sally's Cider Press was new, local folks made cider from their most plentiful crop. Why not continue the tradition? The club could buy bulk apples, take them up to Sally's, extract the juice, and let the fermenting begin. Bring the kids and the carboys!

So again this year, the Sixth Annual TRASH Ciderfest took place in mid-October, coinciding with the most glorious day of the year. The brilliant leaves said fall, but the clear sky and warm temperature said Indian summer.

Over breakfast members shared recipes and tips on their award-winning ciders from years past. "Relax!" they seemed to say. "Cider is easy and forgiving. What's the worst that could happen? You could bottle 'gourmet' vinegar to give to your neighbors!"

At Soergel's Orchard, our pickup trucks took on 20-bushel bins of apples. To figure the amount, Larry had members call ahead to order

the number of gallons they desired. He checked with Sally to determine this year's yield — how much juice per bushel — then figured out how many apples it would take to satisfy the orders. This year it took more than a ton.

Larry worked with the grower for the optimal mix for cider: bushels of Mutsus, Cortlands, Golden Delicious, and Winter Bananas for sweetness; Stayman Winesaps, Northern Spies, and Jonathans for tartness; Macintoshes and Red Delicious for aroma.

Our dozen vehicles, loaded with 30 participants, headed to Sally's Cider Press. Sally and her husband, Tom, have run the press for decades. The antique press

back as the thumping hydraulic ram moves the screens inexorably upward, squeezing until the sweet, brown juice splashes over the sides. The ram retracts, and the attendants heap the friable apple solids aside for later use as compost. The juice is ultimately pumped into a 200-gallon tank, from which it is dispensed through hoses alongside the building.

Club members worked the hoses, filling dozens of cider vessels with about 175 gallons of juice. Some took pH, specific gravity, and refractometer readings. Others measured out sulfite and yeast nutrient (for those who wanted them). Others distributed yeast (ale, lager, and wine). Some members

"go natural," allowing the apples' own wild yeast to do the fermenting.

The pressing complete, the group headed to our house for German food and a cider tasting. More than a dozen of the ciders from last year's pressing were presented. I was amazed that so many different-tasting ciders originated from the same batch of apples. Yeast, Larry told me, makes the difference in character

and taste. A club favorite is made with Belgian saison, an ale yeast. Also popular is cider made with lager yeast and laced with raspberry juice for flavor and color.

A lot went into this sixth Ciderfest. Next year, we'll get to enjoy what comes out of it! ■



It took more than a ton of apples to satisfy this thirsty club's cider needs.

itself is a delightful mechanism, with sights and sounds all its own. In front of the building, a conveyor belt clatters upward, delivering the washed apples to a chopper.

Inside the building an elephantine rubber sleeve delivers the finely chopped apples to wood-framed, burlap-lined screens. Two men load the screens, four high, then stand

Do you have a 750-word story for Last Call? Mail it with a color photo to Last Call, c/o Brew Your Own, 5053 Main Street, Suite A, Manchester Center, VT 05255.

WAS IT BRITISH GUNS OR BRITISH BEER THAT FINALLY SUBDUED THE SUB-CONTINENT?



Back in 1832, the arrival of the first shipload of India Pale Ale must have seemed like a godsend

the soldiers in the British Raj. After all, what sense could the British make of a place like India? If the

heat didn't get to them, the seething mass of

people certainly did. How to enjoy a civilized game of cricket in a country that seemed so...well... uncivilized? When

nipping down to your local for a few quiet ales seemed a far off dream - beyond the smell of burning incense, the colorful swirl of saris and the omnipotent presence of the sacred cow. And so in

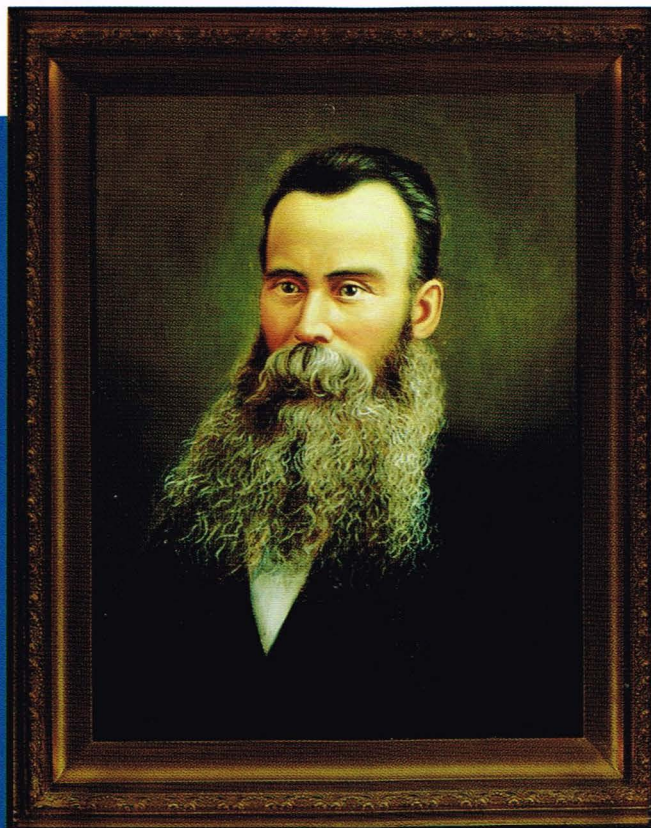
1832, born out of a nostalgic need for a taste of home, the India Pale Ale made its passage to India, from Burton, England to Bombay. As a homebrewer

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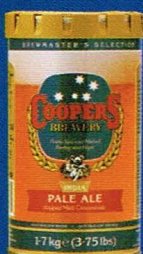
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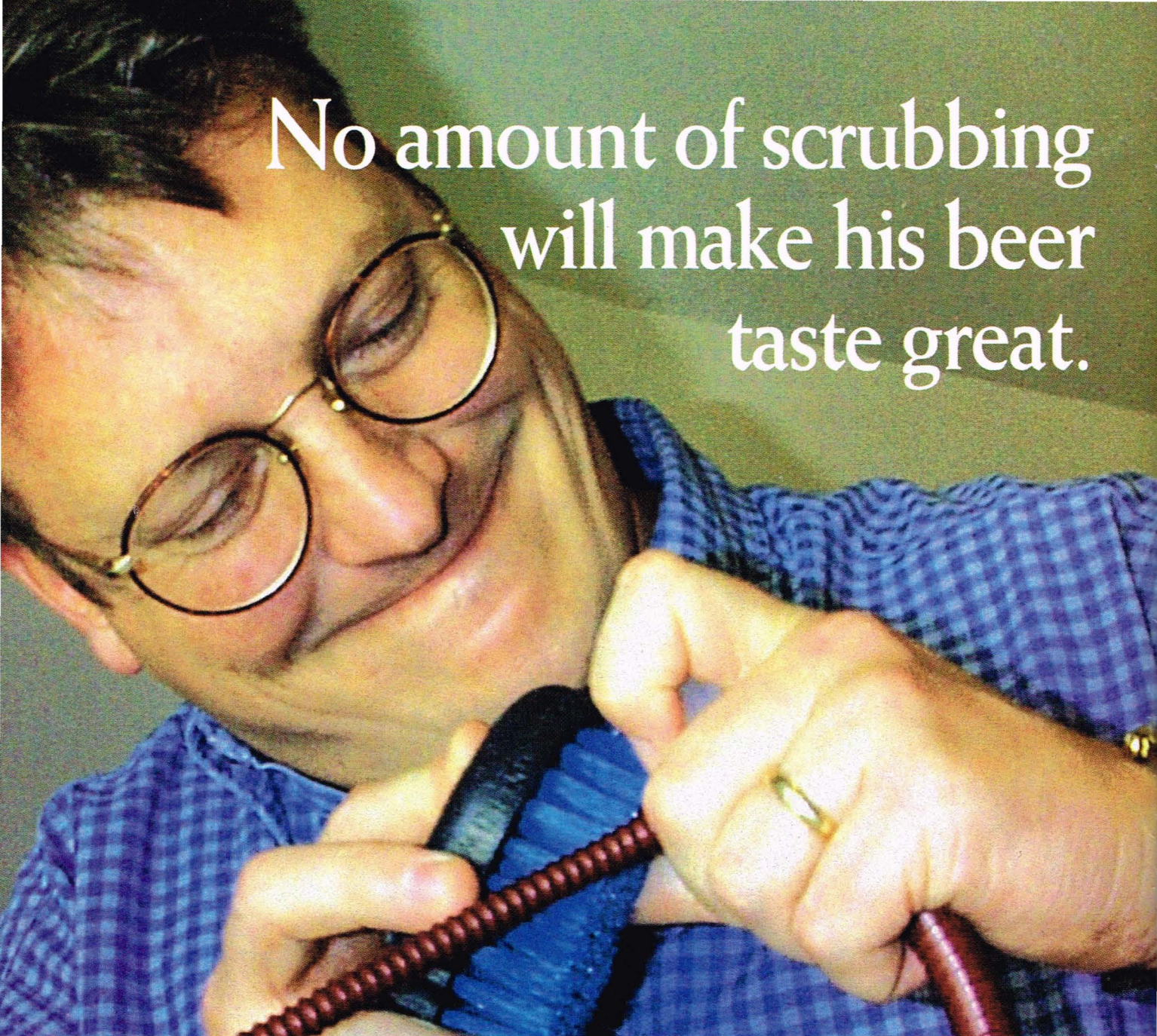
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CIRCLE 10 ON READER SERVICE CARD

A close-up photograph of a man with dark hair and round glasses, wearing a blue and white checkered shirt. He is smiling and looking down at a dark beer bottle he is holding. He is using a blue-handled brush with a dark bristle head to scrub the bottle. The background is a plain, light-colored wall.

No amount of scrubbing will make his beer taste great.

Meet Todd. He's an aficionado of what he believes to be the perfect brew.

His friends think different. See, Todd is into the theory of brewing but he's overlooked one vital factor.

Despite all his efforts, Todd makes his beer on the cheap. He buys the cheaper brand beer kits made from inferior malt.

Whether its malted grain, liquid malt or a kit you're using it's false economy to use cheap ingredients - your beer tastes cheap too!

Sure, the reading and scrubbing are important but it's all academic without the right ingredients.

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Great news, but we're still left with one small problem. Who's going to tell Todd?



If you don't already know Muntons, ask at your nearest brew store. They do.

CIRCLE 29 ON READER SERVICE CARD

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