

FROTH

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A publication of the Brewers of Central Kentucky

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Water, Water, Water

By: Mark L. Roberts

Water constitutes 85%-90% of beer. So 10%-15% of beer is the important part, right? Actually, the rest of beer wouldn't happen without water.

Water has two main functions:

1. It is an essentially benign liquid that dilutes the other ingredients and keeps you from having to use a fork to consume your beer (by the way brewing water is referred to as liquor to distinguish it from water used for cleaning).
2. It contains a number of dissolved minerals in the form of ions (cations and anions) which influence, encourage, discourage or impair the complex chemical reactions which are necessary to produce beer.

Actually, the dissolved minerals and the chemical reactions they affect are two of the driving forces determining quality.

Minerals influence flavor, aroma, color, head retention, clarity, alcohol content and stability.

If your water tastes good, it can make good beer. But knowing something about your water can help you improve your beer.

Soft water is probably the most versatile, because you can add brewing salts to mimic the waters of famous brewing capitals. By the way, you should know that most of the major beer styles were a direct result of brewers discovering what beers could best be made



using the local water. The soft waters of Pilzen lead to the light and clean pilsner beers. The high bicarbonate water of Munich lead to the brewing of dark, malty lagers. The high sulfate content of the waters of Burton-on-Trent resulted in the distinctive India Pale Ales.

So what's in this clear liquid so vital to making beer?

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Lawnmower Beer To Be Banned!?!?

Dateline Frankfort, March 30, 2000

The 2000 General Assembly certainly ended as one of the strangest in recent record. The Republican controlled Senate put a stop to many bills, and last minute maneuvering was frantic and, at times, confusing not just to members of the press but to the members of the House and

Senate as well.

Case in point: the passage of HB 4100. What originated in the House as a bill to prevent the unsupervised operation of riding mowers by children under the age of 12 was hijacked in the Senate by Jefferson County Republican Senator A. F. Day who

gutted the bill and replaced it with provisions being sought by Mothers Against Drunk Drivers (MADD).

Flush with their success in passing the .08% blood alcohol limit (BAL) and the ban on open containers in passenger compartments, MADD took advantage of

Maibock

Specifics:

Recipe type: Extract
 Batch Size: 5 gallons
 Starting Gravity: 1.052
 Finishing Gravity: 1.015
 Time in Boil: 1 hours 20 min
 Primary Fermentation: 14 days
 Secondary Fermentation: 7 weeks

Ingredients:

- 1/2 lb carapils malt
- 1/8 lb chocolate malt
- 1/2 lb crystal malt
- 2 4 lb cans of Alexanders Pale Malt Extract
- 3 oz. Hallertau flower hops 3.2% boil
- 1/2 oz. Hallertau flower hops 3.2% finish
- Pilsen Lager - Liquid "True Blue"

Procedure:

Steeped grain at 140 degrees for 1/2 hour add extract and bring to boil after wort comes to boil add 2 oz. boiling hops boil for 15 minutes add 1 oz. boiling hops boil for one hour add finishing hops at last 5 minutes of boil Cool rapidly and pitch yeast ferment at approximately 48 degrees for both primary and secondary kegged after fermentation was complete and kept stored at 48 degrees

Dunkelweizen

Specifics:

Recipe type: Extract
 Batch Size: 5 gallons
 Starting Gravity: ---
 Finishing Gravity: ---
 Time in Boil: 60 minutes
 Primary Fermentation: 4-5 days at 65-68 degrees F.
 Secondary Fermentation: 5-10 days at 65-68 degrees F.

Ingredients:

- 6.6 lbs Northwestern weizen extract (2 boxes)
- 3 oz crushed chocolate malt
- 6 oz crushed Munich malt
- 1-1/2 oz Mt.Hood hops (~4-5% alpha)
- Wyeast Bavarian wheat yeast

Procedure:

Heat about 2 gallons of water to steaming, but not to boil (about 150 if you've got a thermometer). Place Munich and chocolate malt in a grain bag and soak for about 30 minutes, then remove from water, rinse with fresh hot water, and discard grain. Bring liquid to boil, adding extract. Add hops for full 60 minute boil. Force chill, or use cool-by-diluting-with-cold-water method. Top off to five gallons, and if temperature is suitable for pitching (around 65 to at most 75 F), add yeast. Ferment as indicated above.

Light Lager

Specifics:

Recipe type: All Grain
 Batch Size: 5 Gallons
 Starting Gravity: 1.029
 Finishing Gravity: 1.008
 Time in Boil: 60 Minutes
 Primary Fermentation: 6 days @ 50F in plastic
 Secondary Fermentation: 14 days @ 34F in ss soda keg

Ingredients:

- 5 lbs. Klages 2 Row
- 1.5 lbs. Crystal 20L
- 0.2 oz. Hallertauer Hop Pellets (3.2% AA) 60 minutes
- 0.5 oz. Hallertauer pellets 50 min.
- 0.5 oz Hallertauer pellets 10 min.
- 0.5 oz. Hallertauer pellets when I turn off the heat.
- 0.5 tsp. Irish moss last 15 minutes of boil

Procedure:

Added crushed grains to 6+/- qts. of 176F water and stabilize mash temp. at 150F for 60 minutes. Add 1+/- gallon boiling water to bring mash temp. up to 170F. Hold for 15 minutes. Sparge with about 4 gallons of 170F water. Top up primary fermenter with boiled and cooled water to 5.25 gallons.

HELLO,

I WANTED TO INTERJECT MY TWO CENTS WORTH IN THIS ISSUE. AS "WEBMASTER" OF THE WEBSITE. I'M ALWAYS LOOKING FOR WAYS TO IMPROVE IT. IF YOU FEEL THAT OTHER THINGS ARE NEEDED TO ADD VIRTUAL APPEAL TO OUR WEBSITE OR THAT SOMETHINGS ARE A WASTE OF A SURFER'S TIME, PLEASE TELL ME. I AM ALWAYS MAKING SLIGHT MODIFICATIONS TO THE WEBSITE, SO PLEASE VISIT OFTEN. I HAVE BEE WORKING ON THE ABILITY FOR AN INTERACTIVE RECIPE POST. BUT UNTIL THEN, IF YOU HAVE AN AWARD WINNING RECIPE, OR AT LEAST THINK IT SHOULD HAVE BEEN, SEND IT TO ME. I'LL BE MORE THAN HAPPY TO START POSTING THOSE UNTIL WE CAN GET SOMETHING BETTER IN PLACE.

**THANKS,
 RANDY
 WEBMASTER**

Water Water Water (cont.)

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First, there's probably chlorine if you are using a city source. Free chlorine can be removed by boiling. But due to certain pervasive nasties in water, most cities use chloramines, which can only be removed through the use of an activated carbon filter. My birthday is in May and that would make a good present, if you are interested.

If you are using well water, well, it may not be well. There is every possibility that it could contain nitrates from fertilizers used in agricultural operations. Certain bacteria find nitrates very stimulating and convert them to nitrites which can have a negative effect on fermentation at only 25 ppm (parts per million).

ASIDE--Someone is anal enough to count those little parts. Everything related to water is expressed in parts per million (ppm) or milligrams per liter (mg/l) which is the same thing. The good, the bad and the ugly:

1. Calcium (Ca^{+2}). This is the one. Calcium reacts with phosphates in malt to acidify the mash, which is necessary for creating an environment in which proteolytic (protein reducing) enzymes and diastatic (starch reducing) enzymes work best. A reaction of calcium with phosphates releases hydrogen atoms which lowers the pH.

(pH is the chemical symbol for the logarithm of the reciprocal of hydrogen ion concentration in gram atoms per liter. For example, a pH of 5 indicates a concentration of .00001 gram atoms of hydrogen ions in one liter of solution. Don't thank me for that.)

Back to calcium--Absences of calcium would result in precipitation of oxalate salts causing haze and gushing. In sparge water, calcium inhibits color increase, decreases pickup of tannins and helps improve extraction. In boil it helps protein coagulation. In the fermenter, it helps build strong yeast

bones, so to speak.

Ideal calcium concentration is 50-100 ppm.

2. Sulfate (SO_4^{-2}). Sulfate draws increased bitterness from hops and contributes to dryness of the beer. It can be a source of sulfur if the yeast is given opportunity to produce hydrogen sulfide. In excess of 450-500 ppm it promotes harsh bitterness.

3. Magnesium (Mg^{+2}). Like calcium, but to a lesser degree. Malt contains magnesium. Total magnesium should remain under 30 ppm. In excess of that, it contributes a sour/bitter/salty sensation.

4. Chloride (Cl^{-1}). This ion contributes a fullness of flavor, accentuating the malt. Its effects become evident at 200-250 ppm.

5. Sodium (Na^{+1}). No real positive contribution, although in conjunction with chloride, it does accentuate the malt flavor. Above 150 ppm it gives a salty flavor and contributes to high blood pressure (ok, so I added that).

6. Carbonate (CO_3^{-2}). This ion inhibits crucial chemical reactions. It is the anti-mater to calcium. It is alkaline. It lowers malt yields, increases color, contributes harshness by extracting tannins. A beer with a high pH is unstable and more prone to infection by spoilage organism. Above 50 ppm is where it starts causing trouble. However, you can counteract the effects of bicarbonate by using dark malts, which increase acidity. If your water is over 200 ppm bicarbonate, make only dark beers.

7. Bicarbonate $2(HCO_3^{-1})$. By combining with carbon dioxide and water, bicarbonate has twice the buffering of carbonate (but it is good for an upset stomach). Though more strongly alkaline than carbon-

ate, it is less stable and can be precipitated out by boiling and aerating. Bicarbonate is known as "temporary hardness."

In supporting roles are:

Iron--above .05 ppm gives a, well, iron taste to beer.

Copper--10 ppm kills yeast. Commercial brewers passivate copper kettles with a weak acid solution.

Silicate--Doesn't affect beer but does produce a scale on the sides of commercial brewing vessels.

Zinc--While essential to yeast, over .2 ppm adds a metallic taste.

Manganese.

So here's what you need to know:

What are the minerals in your water? Is your water particularly high in certain ions? How can you make the best use of your water? And finally, how can you adjust your water to imitate the famous brewing waters so that your beer can be as close to style as possible?

As far as your water goes, you have to get an analysis. Your local water supplier should be able to provide you with one.

Frankfort's water is not that great, unless you plan on making dark beers. Here's why. It is relatively low in calcium (13.4 ppm) and high in the dreaded bicarbonates (50 ppm) which actually makes it alkaline (7.2 pH). It is average hard--140. The relatively low amounts of most minerals would make it soft were it not for the bicarbonates. Luckily, bicarbonate can be boiled out or adjusted with gypsum.

To adjust your water, simply take the ions present and add brewing salts until you approach the perfect water. Here are the brewing salts and the ppm a gram of each adds to your water.

1. $CaSO_4$, calcium
(Continued on page 4)

*"Beer is proof that God
loves us and wants us to
be happy."*

-- Benjamin Franklin --

Brewers Of Central Kentucky
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Georgetown, KY 40324

From the Primary Fermenter

The Center for Disease Control this week announced that when beer taxes went up 4 cents per gallon in California, gonorrhea rates dropped by almost 30% for the 15-19 age group. The CDC estimates raising beer taxes by 20 cents a 6 pack would reduce gonorrhea by 9%.

Now you can do some weird things with statistics. So here's a weird thing. Extrapolating their data we soon discover that raising the price of cheap swill by \$2.22 per six pack, making it about \$5 I think, would result in a complete elimination of gonorrhea in the teenage group.

It may be possible to eliminate other dis-

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- sulfate, or gypsum. 1 gram increases calcium 12 ppm and sulfate 30 ppm.
- CaCl₂, calcium chloride. 1 gram increases calcium 14 ppm and chloride 26 ppm.
- MgSO₄, magnesium sulfate, or epsom salt. 1 gram increases magnesium 5 ppm and sulfate 21 ppm.
- NaCl, sodium chloride, or table salt. 1 gram increases sodium 21 ppm and chloride 32 ppm.
- CaCO₃, calcium carbonate, or chalk. 1 gram increases calcium 21 ppm and carbonate 32 ppm.

If hardness is low 50 ppm and pH normal (7), then you can brew any style.

If hardness higher (100 ppm), but pH normal (7), then you won't be able to brew a true pilsner, but you can brew the dryer Dortmunder style and IPAs.

If hardness is higher still (150-250) and pH is high (7.2), you need to pre-boil water to precipitate the bicarbonates

eases by further increasing the cost of a six pack.

Segue into a recent issue of Natural History noted that beer brewed by ancient south Africans contained tetracycline. They found evidence of the antibiotic in bones. They managed to trace it to the yeast used in the beer.

They made beer the ancient way: lightly bake a bread batter, then use the bread in water to make a wort. Seems the yeast under stress of the process produces antibiotics.

So, to tie this all together, maybe Uncle

and/or add gypsum. Or use the most time honored method of acidifying your mash--the addition of toasted or roasted malts. Oh those lovely dark beers.

If hardness is 250 ppm or higher and pH is 7.5, then you need another source of water for brewing.

Sam doesn't need to increase the taxes on beer, but rather require beer to be made the natural, unfiltered way that we homebrewers do. Because beer made our way has food value. (Remember: beer has food value, but food has no beer value.)

Hope this reaches you in time to be of some use. By the by, I'm taking a keg of Bee Sting Texas-style Brown Ale to a Derby Party tomorrow in recognition of National Home Brew Day.

Fermenting always,

Mark L. Roberts



- - Beer is our obsession and we're late for therapy - -

(Continued from page 1)

the partisan Senate politics to push their new national agenda which seeks stricter laws governing the operation of any machinery while under the influence of alcohol.

As a result, Senator Day was able to amend the bill in the waning moments of the session to institute a ban on the operation of mowers while intoxicated. Further, due to the potential harm to children by lawn mowers the BAL for operation of a riding mower was dropped to .04%.

The bill was sneaked through on the Consent Calendar, a list of bills regularly passed without discussion.

Said Day, "There ain't going to be no such thing as lawnmower beer in Kentucky any more. From now on you're going to mow responsibly."

NEXT MEETING
MAY 10
AT
LEXINGTON
CITY
BREWERY
7:00 - 9:00