Brewing with Cleveland Municipal Water

Paul Shick (after Matt Cole, Rick Skains and A.J. DeLange)

This short note is intended as a practical follow up to the inspirational talk that Matt Cole and Rick Skains gave at our June SNOBs meeting. Several questions were raised on brewing with Cleveland water, particularly on dealing with chlorine, and I've attempted to answer them here. I've checked much of what follows with renowned HomeBrew Digest water wizard A.J. DeLange a while back, who graciously took the time to make sure I'm not lying to you.

As Matt and Rick pointed out, Cleveland water is really pretty nice to brew with. It's relatively neutral, in most important respects. The most relevant figures from the Cleveland Division of Water report are the following:

pH 7.0-7.6
Alkalinity: 72-85
Phosphate as P: 0.8-1.3
Hardness: 114-118
Chloride: 18 (rises in winter from road salt)
Total dissolved solids: 175
Calcium: 30.5
Magnesium: 8.8

(These figures are averages from the recent report Dave Clark passed on to me and several earlier reports.)

As brewers, we're concerned with:

1. driving off chlorine. Dave Clark has double-checked with the Cleveland Division of Water and verified that they do not use chloramines (as many cities do), so many of us need to deal only with free chlorine. Matt and Rick suggested carbon filtering for dechlorination, which I strongly second. Cheap and effective activated carbon filters are available from almost any hardware/home center, although you have to keep within the suggested flow rates to be sure to get rid of the chlorine. Matt also suggested boiling to get rid of chlorine (and temporary hardness), although you need a vigorous one hour boil to get rid of the chloramines, which are much more persistent that the free chlorine. A third approach that gets rid of both chlorine and chloramines is to add a campden (potassium or sodium metabisulfite) tablet to the water and dissolve it. A.J.'s measurements show that this is a simple and very effective way to neutralize chlorine/chloramines for 10-15 gallons. Campden tablets are available at any winemaking supply shop. (Steve Alexander has shown that metabisulfite can be used to lower hot-side oxidation in brewing, with the sulfites binding to the potential receptors before oxygen gets a chance. It's certainly works for me, as shown by the far lighter color of my pilsners. About ½ a teaspoon of potassium metabisulfite seems to work nicely for a 10 gallon batch.)

2. salt additions to hit a reasonable mash pH. How you figure this depends on whether or not you follow Matt and Rick's advice on preboiling, which precipitates out the temporary hardness. Here is A.J.'s analysis of our water in this regard:

> "It is not likely that simply boiling your water will result in the precipitation of much chalk. It can be softened to some extent by boiling but addition of additional chalk (to serve as nucleation sites) will probably be required and even in this case you probably wouldn't be able to get the alkalinity much below 60. Lime treatment would perhaps allow you to do a little better but lime treatment is a little involved and not worth it. The water isn't very alkaline anyway. The residual alkalinity is
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> R.A. = alk - [Ca/3.5 + Mg/7 = 85 - [76/3.5 + 36/7] = 58 ppm as CaCO3
>
> worst case and 13 ppm better than that (45) best case. This is right

> around the desirable upper limit of 50. Being over a bit isn't serious. The 76 is the calcium in ppm as CaCO3 calculated from calcium ppm as the ion divided by 20 (the equivalent weight of calcium) times 50 (the equivalent weight of CaCO3). Thus you can calculate how much more calcium is needed to lower the RA by a given amount to 0 the RA you'd need (20)(58)/(50) = 23 ppm more calcium - that's about 100 mg/L gypsum which is not unreasonable by any means for some beers (ales) but which would be a disaster for others (Boh Pils). Apparently your sulfates are somewhere in the 20's. In cases where you don't want to increase this you can always get more calcium from the chloride or you can use malt to supply the pH reducing acid you need rather than relying on the calcium/magnesium - phytin reaction. Even a small percentage of crystal will reduce pH significantly for water no more alkaline than this."

So, if I read A.J. correctly here, we need about 2 grams of gypsum (or calcium chloride, if you're doing a lager or a more delicate ale) per 5 gallons, if you don't preboil, with very little change if you do preboil. By the way, I get roughly 8 teaspoons out of a 1 ounce (28 gram) package of gypsum, so it looks like 1/2 tsp of gypsum per 5 gallons. Funny how it works out that you've been doing the right thing all along, isn't it? Of course, calcium chloride would be preferred for lagers, in general. Keep in mind that dark grains lower the pH significantly, so you don't need much in the way of calcium salts for pH reasons. Also, some people use gypsum as a "flavor salt," in addition to it's pH lowering role, when aiming for Burton-style pale ales. This might require adding gypsum to the boil (strictly for flavor) rather than the mash, avoiding too low a pH. With lots of roasted grains, you might even need to add chalk (CaCO_3) to raise the pH, to offset the lower pH from the dark grain. Finally, for a style where our level of hardness is unacceptable (like a Bohemian Pils), a mix of 80% reverse-osmosis/deionized water with 20% filtered tap water works well, with some calcium chloride added mostly for yeast nutrition.

3. how much acid to get sparge water into the 5.5 or so range? Many brewers use a pH meter to check the mash pH, but ignore checking the sparge water. A.J. agrees with this:

> "Water with this level of alkalinity probably does not need to be acidified for sparging. You can easily verify or disprove that statement by monitoring pH and SG at the outlet of the lauter tun. I think you will probably find that the runoff gravity will be quite low (2-3P) when the pH reaches 6. Given that you want to reduce the sparge pH anyway, probably the simplest is to add a couple of tablespoons of dry malt extract to the sparge water. If you really want to use a mineral or organic acid, go to http://brewery.org/brewery/library/AcidifWaterAJD0497.html for all the gory details on how to calculate the amount."

So go easy on the acid in the sparge water. Personally, I use about 2 teaspoons of 10% phosphoric acid in about 6 gallons of sparge water for light beers, a bit less for darker beers. Some others have suggested that a lower pH yields a smoother bitterness and better hot break, so a less conservative approach might be better.