If in doubt? Final check

Putting it into practice: creating a Pale Ale water profile with East Bay water

EBMUD releases an annual water report. Those who have tested their water have received results very close to the report.

East Bay Water

without understanding what about that profile you desire

Classic water profiles

Tools

What exactly do we care about?

Why does this matter?

Summary

(a presentation by Grant Kinney for Bay Area Mashers on 9 May 2013)

Water Chemistry in Brewing

Margin Brungard - Bruin’ Water Spreadsheet

Kai Troester

Brewing Better Beer by Gordon Strong

What's the hop profile of the beer?

Does it have a high level of carbonates?

Does it have chlorine in it?

Burton-on-Trent

Edinburgh

Dortmund

Dublin

Pilsen

Scale with precision of 0.1 grams

pH meter

Minerals (brewing salts that we can add)

Lack of contamination

Sulfate to Chloride (SO4/Cl) ratio

Mash pH

Control and refinement over desired character of your beer

Done a little bit of experimentation

Brewing science enthusiast

Not an expert

An example recipe

What can we control?

Characteristics:

Style:

Characteristics:

Style:

Characteristics:

Style:

Characteristics:

Water sources, and how the water was treated, probably varied quite a lot within local regions

Lower pH

Raise pH

Chloride (Cl –1)

Chlorine

Magnesium (Mg)

Calcium

Sodium

Potassium

Iron

Sulfate

Bicarbonate

Calcium Carbonate

Sodium Bicarbonate

Calcium Chloride

Magnesium Sulfate

Range:

Combination of sodium with a high concentration of sulfate ions will generate a very harsh bitterness

More than 400ppm can make the bitterness astringent and unpleasant

Bicarbonate (HCO3) vs Carbonate (CO3)

Reducing bicarbonate

Range:

Also contributes to water hardness

More than 50ppm tends to give a sour-bitter taste

Important yeast nutrient in small amounts

Range:

Calcium is what creates hard water

Most important for yeast health (generally accepted that you need min of 50ppm)

Range:

Removing

Chloramine is a better purifier, but harder to remove

Boil water, chalk will form on the bottom, decant water off top

150–250ppm for dark, roasted malt beers

50–150ppm for amber-colored, toasted malt beers

0–50ppm for pale, base malt only beers

150–350ppm for very bitter beers

Boiling (less effective for chloramine)

Let it breath–the more surface area open to air, the better

10–30ppm

50–150ppm

0–150ppm

50–150ppm

0–150ppm

haze

Higher is more alkaline (less acidic)

Much better to add appropriate salts as calculated for your water

Works slightly better in water with high bicarbonates

Doesn’t really work that well

IPA

Red-amber lagers

Pale lagers

Stout

Pilsner

High sulfate and low sodium produce an assertive, clean hop bitterness

High calcium and sulfate, but balanced hardness and alkalinity

Beers with heavier malt body and fewer hops to achieve balance

Similar to London, but with more bicarbonate and sulfate

Higher carbonate level dictated using toasted and dark malts to balance mash pH

Low sulfate content provides mellow hop bitterness

Moderate in most minerals, but a higher in carbonates

Historically, the added more toasted malts to compensate for this

Similar to Dortmund, but with lower sodium and chloride that accentuate malt flavor

Less hop character than Pilsners

High bicarbonate concentration suited for darker, malty beers

Lake of sulfate for a mellow hop bitterness

Much better to add appropriate salts as calculated for your water

Works slightly better in water with high bicarbonates

Doesn’t really work that well