

# BrewCipher Version 6.6 User Guide

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**Don't panic!** This User Guide is extensive and detailed. Most users never read it. But it's here if you need it or are simply interested in looking under the hood a bit more. Also, inside the actual spreadsheet, "tricky" input and output cells that are not painfully obvious have mouse-over pop-up comments to help you understand what should/can go there.

**QUICK START:** Enter/change any appropriate parameters in the "Volumes and Volume Losses" section of the Brewhouse tab. Congrats! You're already at a level of sophistication higher than on-line "calculators." Next, start building your first recipe on the recipe tab. (There's lots more to explore later.)



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# Introduction

## What is BrewCipher?

BrewCipher is a general purpose brewing workbook that is designed in an integrated way. Instead of several standalone calculators, the tabs in the BrewCipher workbook share data, which saves the user time.

## Why BrewCipher?

I developed BrewCipher mainly because none of the other software programs or spreadsheets predicted attenuation, and thus final gravity, very well. For the most part, the only variable taken into consideration was yeast strain. BrewCipher adds mash temperature, mash length, and grain bill to the variables used to predict attenuation. BrewCipher is not open source, but it is a collaborative effort. BrewCipher was originally inspired by the work of Mattbk of the Beer Advocate (BA) homebrewing forum. The attenuation calculation model uses data published by Greg Doss and Kai Troester. Post-boil hop additions are modeled based on the work of Mark G. Malowicki. The water chemistry models were developed by utahbeerdude of the BA forum. Refractometer conversion calculations are based on the work of Sean Terrill. BrewCipher continues to evolve, based on ideas suggested by users. Perhaps best of all, BrewCipher is free.

## About this User Guide

This guide is fairly long and detailed. However, it's not intended for users to have to read the whole thing before using BrewCipher. Many users only use BrewCipher's Recipe Tab, which is by itself an integrated improvement over the typical assortment of disconnected on-line calculators. The Brewhouse (parameters) Tab has been pre-loaded with defaults that will work well for many typical breweries, but the parameters are there if and when you're ready to get the most out of the package. The Water Tab is there if and when you're ready to pay attention to mash pH and/or build your own water profiles, etc.

## Features

BrewCipher has the following features:

- Predicts attenuation based not only on yeast strain, but also on mash conditions and grain bill composition.
- Understands that simple sugars are 100% fermentable, and that they are not subject to mash efficiency or yeast strain factors.
- Understands that some gravity contributors are not fermentable at all.
- Accounts explicitly for wort and water losses, and adjusts total water (and related calculations) accordingly.
- Uses a correct Tinseth formula with Avg Boil Gravity in the “bigness” factor rather than the pre-boil OG (which is both popular and wrong).
- Incorporates optional Modified Tinseth and Rager IBU Formulas...
  - Limits IBUs to 110 (solubility limit).
  - Splices a new utilization curve to the Tinseth and Rager utilization curves above 65 IBUs, to more closely agree with actual vs theoretical IBUs measured.
  - Adds bitterness contributions for post boil hop additions, modeled and extrapolated from the work of Mark G. Malowicki.
  - Hop Utilization Multiplier parameter to fine tune hop utilization to your system.
  - First Wort Hopping (pre-boil) bittering contribution
  - Supports CO2 Hop Extract and Cryo Hops
- Supports single infusion batches with single batch sparge (or mashout and lauter), Brew-In-A-Bag, and step infusions.
- Wort Oxygenation and Lagering Days Recommendations.

## Features (cont.)

- Highlights any Gravities, ABVs, IBUs, and SRMs that are not within BJCP style guidelines.
- Computes Diastatic Power for the Mash, and warns when the grist's DP is marginal or poor.
- Scales Grain Bill to any desired Original Gravity.
- Calculates Mash pH and results of acid and Brewing Salt Additions, including Sparge Water acidification.
- Predicts Mash Efficiency based on known Efficiency and change in grain weight and/or sparge to no-sparge or vice versa.
- Automatically computes Yeast Starter Volumes, including stepped starters. Supports harvested yeast slurries.
- Includes an optional, alternate ABV calculation.
- Inputs for Post Boil/Post Fermentation gravity and volume data, to compute actual mash efficiency, attenuation, and ABV.
- Converts Refractometer readings to Specific Gravity Values.
- Choice of U.S. standard measurements or Metric.
- Choice of Plato or SG gravity measurements.
- Bottle Carbonation and Kegging calculations
- Mash Tun Over Capacity and Temperature Warnings

## Non-Features

BrewCipher limitations:

- Does not do decoction mashes.
- Does not save recipes in a database. (You save each recipe as its own Excel or Open Office workbook and give it its own name.)

# System Requirements

## Operating System

BrewCipher is a Microsoft Excel (or OpenOffice, LibreOffice, or Gnumeric) Workbook, intended to be used on Windows computers. It may or may not work on Mac computers. If you try it, let me know. BrewCipher reportedly works using the Excel App on iOS platforms.

## Software

BrewCipher is downloaded from Google Docs or DropBox, but does not *run* in them. It must be downloaded to your computer (or a remote drive) and run in Microsoft Excel (preferred), Apache OpenOffice, LibreOffice, or Gnumeric. If using Excel or Gnumeric, download the .xls version. If using OpenOffice or LibreOffice, download the .ods version. Note: Macros (including BrewCipher's automatic scaling features) don't work in Gnumeric, but you don't need those macros to use BrewCipher.

# System Requirements (cont.)

## Special Considerations if running in Apache OpenOffice

BrewCipher can be run in Apache OpenOffice rather than the preferred Microsoft Excel. If running in OpenOffice, you'll need to do the following...

- Download the .ods (not .xls) version of the BrewCipher workbook.
- When saving your workbooks, keep them in .ods format. Don't "Save As" any other format.
- If you want to be able to use the grain bill scaling function, you'll need to enable macros in OpenOffice's application settings (not just for the document). To do this...
  - Tools -> Options -> (expand) Load/Save -> VBA Properties -> (checkbox) Executable Code -> OK
- Understand that user-saved "generic" water profile targets won't be properly displayed in OpenOffice. Recipe-specific profiles and default available profile targets display fine.



# Brewhouse Parameters

## The Brewhouse Tab

The Brewhouse tab is where you enter information about your brewery, i.e. your equipment and process, which is not unique to specific recipes. For most of these parameters, you'll only enter them once, or infrequently at most. These parameters are important in that they allow BrewCipher to give the most accurate results possible for your particular system. However, the default values that come pre-loaded are reasonable for many typical homebrew setups. Parameters are entered in the blue cells. A discussion of each parameter, what it means, and how to set it follows.

## Volumes and Volume Losses Section

This is where you enter Brewhouse parameters related to various losses of water and wort.

**Strike Hot Liquor Tank Deadspace:** The amount of Water that will be left behind in the Hot Liquor Tank (HLT) that feeds the Strike water for the mash because of the non-drainable space at the bottom of the HLT. To determine your Dead Space, add a known volume of water to your HLT and drain. Measure the volume of water that runs off. Subtract this volume from the initial volume. The result is Dead Space. Enter in gallons if using U.S. measurements or in liters if using Metric. If you don't use a Strike HLT, enter 0. Note: If the Strike Hot Liquor Tank and the Sparge Hot Liquor Tank are the same physical unit, enter the deadspace in both parameters and select 'Y' from the "Are Both HLTs the SAME physical unit?" dropdown.

## The Brewhouse Tab (cont.)

### Volumes and Volume Losses section (cont.)

**Sparge Hot Liquor Tank Deadspace:** The amount of Water that will be left behind in the Hot Liquor Tank (HLT) that feeds the water for the sparge (or mashout) because of the non-drainable space at the bottom of the HLT. To determine your Dead Space, add a known volume of water to your HLT and drain. Measure the volume of water that runs off. Subtract this volume from the initial volume. The result is Dead Space. Enter in gallons if using U.S. measurements or in liters if using Metric. If you don't use a Sparge HLT, enter 0. Note: If the Strike Hot Liquor Tank and the Sparge Hot Liquor Tank are the same physical unit, enter the deadspace in both parameters and select 'Y' from the "Are Both HLTs the SAME physical unit?" dropdown.

**Are Both HLTs the SAME physical unit?:** If the Strike HLT and the Sparge HLT are the same unit, select 'Y'. This will inform the calculations that whatever deadspace is filled with Strike Water will not need to be refilled when Sparge (or Mashout) Water is Added. Select 'N' if each HLT is a separate unit, or if you don't use a HLT for strike and/or sparge.

**Grain Absorption Loss:** This is the amount of wort that will be left behind in the mash tun due to being trapped in the spent grains. This parameter is important because BrewCipher uses it along with other parameters to determine how much additional water/wort will be needed to ensure the final desired batch volume is reached. 0.12 gallons per lb of grain is a reasonable default value until you have dialed in your system, i.e. experienced something different. Enter in gallons per pound if using U.S. measurements or in liters per kilogram if using Metric.

**Mash Tun Capacity:** The total capacity of your mash tun, including any dead space. This value is used to compute whether a recipe's grains and strike water will fit. If not, a warning is displayed in the Strike Water area of the Outputs section on the Recipe tab.

## The Brewhouse Tab (cont.)

### Volumes and Volume Losses section (cont.)

**Mash Tun Dead Space:** The volume of wort that will be left behind in the Mash Tun because of the non-drainable space at the bottom. This parameter is important because BrewCipher uses it along with other parameters to determine how much additional wort will be needed to ensure the final desired batch volume is reached. Quick and Dirty Measurement for a typical False Bottom setup: To determine your Dead Space, add a known volume of water to your mash tun (no grain), and drain as with a normal lauter. Measure the volume of water that runs off. Subtract this volume from the initial volume. The result is Dead Space loss. A better way to determine the dead space, particularly if you do not have a false bottom: Make a batch of wort by mashing in your tun. Measure the difference between the runoff volume and the original volume of water. Then subtract grain absorption at about 0.12 gallons per pound. Enter the result in the Dead Space parameter.

**Boil Off per Hour:** This is the amount of water that boils away in one hour with your kettle and heat source. It's important because BrewCipher uses it along with other parameters to determine how much additional water will be needed to ensure the final desired batch volume is reached. To determine your boil off rate, boil a known volume of wort (or water) for a known amount of time, and subtract the final volume from the original volume. The test can be less than 60 minutes: just multiply the loss by  $60/X$ , where  $X$  is the minutes boiled. Enter in gallons if using U.S. measurements or in liters if using Metric. BrewCipher's default is 1.24 gallons per hour.

**Cooling Loss:** This is the amount of water that typically evaporates away from your wort during the time it is cooling. This is a new parameter in BrewCipher in version 3.5. If you have previously dialed-in your system without it, you may want to leave it at 0, as you have probably already accounted for it by proxy in your Boil Off rate. Note: This is *not* the natural contraction of the wort due to being at a lower temperature. It's actual evaporation.

## The Brewhouse Tab (cont.)

### Volumes and Volume Losses section (cont.)

**Leaf Hop Trub Loss** and **Pellet Hop Trub Loss:** These two parameters account for the wort that will be trapped in the hops and thus will not make it to the fermenter. These parameters are important because BrewCipher uses them along with other parameters to determine how much additional wort will be needed to ensure the final desired batch volume is reached. 0.0625 gallons per ounce (for leaf) and 0.0250 gallons per ounce (for pellets) are reasonable default values until you have dialed in your system, i.e. experienced something different. Enter in gallons per ounce if using U.S. measurements or in liters per kilogram if using Metric.

**Kettle Deadspace:** This is the amount of wort that will be left behind in the kettle because of the non-drainable space at the bottom. This parameter is important because BrewCipher uses it along with other parameters to determine how much additional wort will be needed to ensure the final desired batch volume is reached. To determine your Dead Space, add a known volume of water to your kettle and drain by your normal method. Measure the volume of water that runs off. Subtract this volume from the initial volume. The result is Kettle Dead Space loss. Enter in gallons if using U.S. measurements or in liters if using Metric.

**Hops Remain in Kettle Deadspace?:** After you drain your kettle, are the hops in the kettle deadspace? If Yes, the calculation will ensure that the same wort loss is not counted for both hop absorption and kettle deadspace loss. If No, the losses are additive. Select 'N' from the dropdown if the kettle hops are removed (e.g. via a hop bag) or blocked above the deadspace by a false bottom. If the Kettle Deadspace is 0, this parameter has no effect.

## The Brewhouse Tab (cont.)

### Volumes and Volume Losses section (cont.)

**Hose/Pump/Siphon Loss:** Hose/Pump/Siphon Loss is the amount of wort lost in the hosing/siphon and/or pump when transferring wort from the kettle to the Fermenter. It's important because BrewCipher uses it along with other parameters to determine how much additional wort will be needed to ensure the final desired batch volume is reached. If you don't use a pump or hose/siphon to transfer, the value should be 0. Enter in gallons if using U.S. measurements or in liters if using Metric.

### Thermal Properties section

**Mash Tun Initial Heat Absorption Value:** This parameter accounts for the thermal mass of the mash tun. It's expressed in terms of the volume of water (in QUARTS or LITERS) that would have the same heat capacity, thus allowing it to be used in standard strike water and sparge water temperature calculations. I have measured my Coleman Xtreme 52 quart cooler to have an approximate value of 0.74 Quarts. If you consistently overshoot your intended mash temps, decrease this value. If you consistently undershoot your desired mash temps, increase it. (If using Metric (rather than U.S.) measures, the Coleman Extreme would be equivalent to about 0.70 Liters.) Be sure to enter this value in Quarts if using U.S. measurements or in Liters if using Metric. *Note: If you are a metric user and had either dialed in this parameter or used the default value prior to Version 5.1 and it worked well for you, divide the value you were previously using by 4 for use in version 5.1 or later.*

**Mash Tun Heat Loss per Hour:** This parameter accounts for the drop in mash temperature over a 60 minute mash time. If your measured Mashout temps are significantly below 168F, increase this value. If higher than 168F, decrease it. Enter in degrees F if using U.S. measurements or in degrees C if using Metric.

## The Brewhouse Tab (cont.)

### **Brew-In-A-Bag section**

**Brew-In-A-Bag Indicator:** Generally, if you mash using the BIAB method, select 'Y' from the dropdown. This will force all of the water to be in the first infusion, and the Water to Grain Ratio entered on the Recipe tab will be ignored. However, if you do BIAB but do *not* want to include all your water in the first infusion, select 'N' from the dropdown. Generally, if you do not do BIAB, select 'N' from the dropdown. However, If you do not do BIAB, but *do* want all of the water to be in the first infusion, select 'Y' from the dropdown.

### **Measurement Systems section**

**Measurement System:** Select here (from the dropdown) whether you brew using U.S. measurement standards or Metric for weights and volumes. This parameter determines how the formulae should treat the inputs and the format for the input and output cell titles. It's not in itself a conversion calculator. If you select U.S., most inputs/outputs will use U.S. standards, but some will use metric where it makes sense (like milliliters and grams for small very quantities). If you switch from one system to the other, you will need to recalculate and re-input your entries.

**Gravity Measurement System:** Select here (from the dropdown) whether you measure gravity in degrees Plato or use the Specific Gravity scale. This will determine which gravity system is displayed in BrewCipher inputs and outputs.

## The Brewhouse Tab (cont.)

### Yeast Parameters section

**Yeast Starter Type:** This parameter, along with others, determines yeast starter growth rates. If you use a stir plate for your starters, select “Stir Plate.” Otherwise, select “Periodic Shaking” and give your starter a swirl now and then.

**Ale Yeast Pitch Rate (Cells/ml/Degree P):** This is the target pitch rate for Ales. BrewCipher will determine the starter size(s) and number of steps needed to achieve it. The recommended value is 750,000, which is a de facto standard. This parameter should be changed by advanced users only.

**Lager Pitch Rate (Cells/ml/Degree P):** This is the target yeast pitch rate for Lagers. BrewCipher will determine the starter size(s) and number of steps needed to achieve it. The recommended value is 1,500,000. This parameter should be changed by advanced users only.

**Hybrid Pitch Rate (Cells/ml/Degree P):** This is the target yeast pitch rate for Hybrid Styles. BrewCipher will determine the starter size(s) and number of steps needed to achieve it. The recommended value is 1,000,000. This parameter should be changed by advanced users only.

**Min Step Inoc Rate (millions cells / ml):** To ensure healthy yeast propagation, the yeast starter calculation will ensure that no individual yeast starter step is inoculated with less cells than this threshold. The recommended value is 25, meaning that the inoculation rate would never be allowed to be below at least 25 million cells per milliliter of starter wort. If the natural result of a starter step would fall below this value, it will instead be forced to the inoculation rate specified in the 'Force Step Inoc Rate' parameter below. This parameter should be changed by advanced users only.

## The Brewhouse Tab (cont.)

### Yeast Parameters section (cont.)

**Force Step Inoc Rate (millions cells /ml):** To ensure healthy yeast propagation, the yeast starter calculation will ensure that no individual yeast starter step is inoculated with less cells than the threshold specified in the 'Min Step Inoc Rate' parameter above. If the natural result of a starter step would fall below that value, it will instead be forced to the inoculation rate specified in this 'Force Step Inoc Rate' parameter. The recommended forced value is 100, meaning that the inoculation rate would be forced to 100 million cells per milliliter of starter wort. This parameter should be changed by advanced users only.

**Yeast Cells per Fresh Package (Billions) :** This is the number of viable yeast cells (in Billions) per *fresh* package, and is used by the yeast starter calculations. For brewers using Wyeast smack packs or White Labs vials, the recommended value is 100. For Yeast Bay vials, the recommended value is 80. Commercial brewers should enter the appropriate number of cells (in Billions) for the containers obtained from their suppliers.

**Yeast Age Death Rate per Day:** Specifies the percentage of remaining yeast cells that dies each day due to age. The recommended value is 0.7%, which results in about 81% viability after one month. This is in the middle of the range quoted by White Labs after one month. The same death rate is used for both packs/vials and harvested slurry. If you believe harvested yeast dies off at a faster rate than pack/vial yeast, change it here before doing slurry computations on the recipe tab. This parameter should be changed by advanced users only.



## The Brewhouse Tab (cont.)

### Yeast Parameters section (cont.)

**Repitch Slurry Density (Billions cells/ml):** If you Repitch Yeast, this is the 'thickness' of the Slurry. It's used in yeast starter calculations where appropriate. A very thick, compacted slurry would be about 4.5 Billion cells per milliliter. An 'average' density thickness might be 2.4 Billion cells per milliliter. A thin slurry might be 1 Billion cells per Milliliter. Factors that affect density include how long the slurry has been settling (and at what temperature) and the flocculation tendency of the strain. This parameter estimates cells as if the slurry consists *only* of liquid and yeast. The accompanying parameter (non-yeast %) accounts for the fact that there are other solids in any slurry. This value should be changed by advanced users only.

**Slurry Solids Non-Yeast %:** This is the percentage of your harvested yeast slurry solids that are something other than live yeast (such as hop particles, lipids, dead yeast, etc.). An average recommended value for this parameter is 15 (for 15%). If you rinse your yeast, your value may be closer to 0. If you are pitching directly onto a yeast cake, your value might be closer to 25 or even 50. This percentage is use to reduce the effective cell density specified in the accompanying parameter (Repitch Slurry Density). This parameter should be changed by advanced users only.

## The Brewhouse Tab (cont.)

### Power Knobs section

**Attenuation Power Factor:** BrewCipher predicts attenuation, and thus final gravity, based on yeast strain, grain bill, mash time, and mash length. There are a myriad of other small (and largely un-modelable) factors beyond the scope of the model. Also, there will be variability from brewhouse to brewhouse even within the same nominal values for the modeled parameters. Some examples: accuracy of thermometers and hydrometers; mashout or lack of mashout; time to transfer wort to kettle and temperatures during transfer; time to reach a boil; grain differences between maltsters; general health of yeast; etc. These other factors are the reason for the Attenuation Power Factor. If you consistently get more attenuation than predicted (across many recipes), adjust this factor upward. If you consistently get less attenuation than predicted (across many recipes), adjust this factor downward. Otherwise, leave this at the default (0.984) or at 1.000. The default value of 0.984 dials-in the attenuation predictions in *my* brewhouse, resulting in the smallest average deviation between predictions and actual measurements. Your mileage may (and probably will) vary! *Note: This factor affects ALL mashes, including Multi-Step Infusions. But if your attenuation variances are ONLY when you do Multi-Step Infusion Mashes, leave this factor alone and adjust the "STEP INFUSION ATTENUATION POWER FACTOR" instead.*

**Step Infusion Attenuation Power Factor:** If, when using MULTI-STEP INFUSION MASHES, you consistently get more attenuation than predicted, adjust this factor upward. If you consistently get less attenuation than predicted (across many recipes and strains), adjust this factor downward. Otherwise, leave this at the default of 1.000. *If the attenuation variances you are experiencing are consistent across all/most recipes, including single step infusions (i.e. not just multi-step), leave this parameter alone, and adjust the basic "ATTENUATION POWER FACTOR" instead.*

## The Brewhouse Tab (cont.)

### Power Knobs section (cont.)

**Hop Utilization Multiplier:** Hop utilization (the bitterness derived from a given quantity of hops, wort gravity, and boil time) is somewhat brewhouse specific. However, the Tinseth and Rager formulas assume standard utilization values. In fact, the Tinseth standard was the utilization Glenn Tinseth got brewing on his own system. If you measure your actual IBUs and consistently get more (or less) IBUs than predicted, you can enter a multiplication factor here to more closely match your average results. (The default is 1.0, i.e. no adjustment.) This multiplier does *not* affect the standard Tinseth and Rager formulas. It does affect the modified Tinseth and Rager formulas, and is applied before the "above 65 IBU slope adjustment" and the "110 IBU Ceiling" constraint. This parameter is recommended for advanced users only.

**Pellet/Leaf Hop Bonus/Penalty Factor:** The standard Tinseth IBU Formula assumes Leaf Hops. The Rager Formula assumes (legend has it) Pellet Hops. This factor does the following...

For Tinseth, *multiplies* utilization by the factor if using pellet hops.

For Rager, *divides* utilization by the factor if using leaf hops.

The recommended default value is 1.1000. A factor of 1.1000 means 10% more utilization for pellet hops than for leaf. This parameter affects both the standard models and the modified models. This parameter is recommended for advanced users only.

**Cryo Hops Bonus Factor and CO2 Hop Extract Bonus Factor:** These values are used to multiply utilization by the appropriate factor if using these hop forms. Defaults are 1.1 and 1.3, respectively. Brave new world...dial-in as needed.

## The Brewhouse Tab (cont.)

### Power Knobs section (cont.)

**Keg Line Resistance Multiplier:** This multiplier increases/decreases the line resistance used by the keg beer line length calc on the Carbonation Tab. The calc uses a standard resistance per length value for each line type, but actual resistance can differ between brands, age, and cleanliness. If you tend to get too much foam, slightly decrease this multiplier value, which will cause the calc to recommend a longer line to compensate for the lower resistance. If you tend to get not enough foam, slightly increase this multiplier value, which will cause the calc to recommend a shorter line to compensate for the higher resistance. Note: Changing length doesn't really fix foaming problems caused by warm lines/faucets. It can compensate somewhat, but the best fix for that problem is to keep the lines and faucets closer to the temperature of the kegs.

### IBU Models Section

**IBU Model:** Select your preferred IBU model. The Tinseth Model is generally accepted as more accurate, but some brewers are more accustomed to/comfortable with the Rager model.

# Building Recipes

## The Recipe Tab

The Recipe tab is the sheet where you will build your recipes. The data you enter on it will largely be different from batch to batch. Because BrewCipher is a Spreadsheet Workbook (and not a relational database), you'll want to save the whole workbook with a different name for each recipe you build and brew. (It's easiest to start with your most recent completed recipe when starting a new one, so that your Brewhouse parameters don't have to be re-entered.) You'll enter your recipe data in the blue cells, and see the predicted results in various white cells in the Grain, Hops, and Yeast sections, as well as the overall predicted results section at the bottom of the sheet. A discussion of each input cell/area, what it means, and how to input it follows, as do descriptions of what the results mean.

### **Batch Size (into fermenter)**

This is where you enter your desired batch size, expressed as the volume of wort that goes into the fermenter. Enter this value in Gallons if using U.S. measurements or in Liters if using Metric.

### **Mash Temperature (degrees)**

Enter your desired mash temperature. BrewCipher uses this value, along with other information, to predict attenuation and to determine the strike water temperature needed. Enter this value in degrees Fahrenheit if using U.S. measurements or in degrees Celsius if using Metric.

## The Recipe Tab (cont.)

### **Mash Time (minutes)**

Select your planned Mash Time from the dropdown. BrewCipher uses this value, along with other information, to predict attenuation. If you select "Multi-Step," most mash information on the recipe tab will be blacked out, and you'll build your multi-step mash on the Step Mash tab.

### **Recipe Name**

Enter your Recipe Name here. It doesn't affect anything, except for Mojo.

### **Mash Efficiency**

Enter your expected Mash Efficiency here, as a percentage. BrewCipher uses it, along with other information, to determine the expected Original Gravity of your wort. Tip: Once you know your (actual) mash efficiency for a given recipe, you can use the Mash Efficiency Predictor tab to predict the Mash Efficiency you would get for batches with larger or smaller grain bills, and/or when switching between sparge and no-sparge (or vice versa) techniques.

### **Strike Water to Grain Ratio**

Enter your planned ratio of mash Water to Grains here. Generally, you'll want to keep this ratio between 1.0 and 2.0 quarts per pound. BrewCipher uses this value, along with other information, to determine the amounts of strike water and sparge (or mashout) water needed. Enter this value in Quarts per Pound if using U.S. measurements or in Liters per Kilogram if using Metric. Tip: If the Brew-In-A-Bag Indicator on the Brewhouse parameters tab is set to 'Y,' this ratio will be ignored, because all the water will be forced to the first (strike) infusion, leaving 0 water for mashout/sparge.

## The Recipe Tab (cont.)

### **Ambient Grain and Tun Temp (degrees)**

Enter the temperature of the Grains and Mash Tun (generally your room temperature) here. BrewCipher uses this value, along with other information, to determine the temperature of the strike water needed for the mash. Enter this value in degrees Fahrenheit if using U.S. measurements or in degrees Celsius if using Metric.

### **Boil Time (minutes)**

Enter your planned Boil Time here. This is the interval between reaching a full boil and turning off the heat. BrewCipher uses this value, along with other information, to determine how much water will boil away, and thus how much total water is needed. Tip: 60 minute boils and 90 minute boils are somewhat standard. Many brewers use 60 minute boils for most recipes, but extend to 90 minutes for recipes containing significant amounts of pilsner malt, in order to ensure that most of the Dimethyl Sulfide (DMS) is boiled away. (Pilsner malts contain larger amounts of a DMS precursor than non-pilsner malts.) Longer boils also result in increased bittering hop utilization, darkening of the wort, and require more mashout/sparge water which can help achieve a higher mash efficiency if that's your thing.

### **Style**

Select the recipe's beer style from the dropdown. BrewCipher uses this to determine if the predicted results (Gravities, ABV, IBUs, Color) are within the BJCP style guidelines. BJCP 2015 styles are at the top of the list. The old 2008 styles are at the bottom of the list, and prefixed with "08-".

### **Brew Date**

Enter your Brew Date here. It doesn't affect anything else in the spreadsheet.

## The Recipe Tab (cont.)

### Grains, Fermentables, Other section

This is where you enter your grain bill.

**Lbs. (or kg):** This is the weight of each grain/fermentable. Enter this value in Pounds if using U.S. measurements or in Kilograms if using Metric. BrewCipher uses this, along with PPG and Mash Efficiency (where applicable) to determine the gravity of your wort.

**Prop:** This column displays the proportion (%) of the grain bill represented by each ingredient entered. Tip: if you know the proportions you want, but not the amounts, enter the percentages *as whole numbers* in the Lbs. (or kg) column, enter the Target post-boil Original Gravity, and click the Scale! button.

**Ingredient:** Select your grain/fermentable from the dropdown box. If you need a grain that's not listed, you can add it on the GRAINLOOKUP tab.

**PPG:** This column displays the maximum Points per Pound per Gallon of the grain/fermentable selected. Example: If an ingredient has 37 PPG, one pound of it would contribute a maximum of 37 gravity points to one gallon of water, resulting in a maximum original gravity of 1.037. In practice, the contribution will be lower for mashed/steeped grains, because mash efficiency (see above) is always less than 100%. For simple sugars and for liquid and dry malt extracts, the contribution is not subject to mash efficiency. If you have selected an ingredient, but believe the PPG (maximum, prior to mash efficiency if applicable) is different than displayed, you can change the PPG for that ingredient on the GRAINLOOKUP tab.

**Rice Hulls (Only):** If you use Rice Hulls, enter their weight in this cell. Rice hulls are useful to prevent stuck sparges when using sticky ingredients like wheat or rye.

**Scale! Button:** If you want to target a specific post-boil Original Gravity (OG), enter that OG in the blue cell next to the button, then click the Scale! Button. Tip: You may need to enable macros for the current workbook first.



## The Recipe Tab (cont.)

### Boil Hops Section

This is where you enter hops that will be used during the boil (or optionally, at flameout).

**Hop:** Select the hop variety from the dropdown. If you need a hop that's not listed, you can add it on the HOPLOOKUP tab.

**Type (L/P):** Select 'L' for Leaf, 'P' for Pellet, 'C' for Cryo, or 'E' for (CO2) Extract from the dropdown. BrewCIPHER adjusts for hop utilization depending on the type. The hop type also affects the volume of pre-boil wort required, because hop wort absorption is different between types.

**Ounces (or Grams):** Enter the weight of the hop addition here. Enter this value in Ounces if using U.S. measurements or in Grams if using Metric. Tip: When you change hop amounts, your wort gravity will change. That's because more (or less) wort will be needed due to hop wort absorption, which means more (or less) water is required, which (for a given mash efficiency) means a lower (or higher) gravity. It's a good idea to run the grain Scale! macro after changing hop amounts significantly, to bring your OG back in line. This can be an iterative process between hop and grain amount changes.

**Minutes:** Enter the minutes from the end of the boil that each hop addition will be added. Enter "FW" for First Wort hops. Enter flameout/whirlpool/hopstand additions as 0 minutes, or enter them instead in the Flameout/Whirlpool/Hopstand section if you want their IBU contributions to be considered in the Modified Tinseth or Rager IBU calculations.

**AA%:** Typical Alpha Acid % for the selected hop variety is displayed here. If your hops are different, enter the actual AA% in the AA% Override column.

**AA% Override:** If the Alpha Acid % of your hops is different from the value in the AA% column, enter the actual AA% here.

**IBUs:** This column displays the estimated unconstrained (standard Tinseth or Rager) IBU contribution for each hop addition.

## The Recipe Tab (cont.)

### Boil Hops Section (cont.)

**Scale! Button:** To scale your current boil hop bill up or down, enter the desired IBUs (Standard model Tinseth or Rager IBUs) in the Target Standard Model IBUs cell to the right, click in another cell (to move off of the input cell), then click the Scale! button. Hop quantities will be automatically updated. Tip: You may need to enable macros for the current workbook first.

Note that when increasing hops, BrewCipher adds water (due to hop absorption) to maintain batch size. That extra water means even more hops to maintain the new bitterness level. BrewCipher cycles through this phenomenon iteratively to converge on the target. The natural result is a lower post boil Original Gravity. (Decreasing hops causes a similar phenomenon, but opposite.) If you want to scale your boil hops while maintaining (or newly targeting) a certain post-boil Original Gravity and Flameout/Whirlpool/Hopstand IBUs (if applicable), use the ComboScale button instead.

**ComboScale Button:** The ComboScale button can be used to target your desired pre-boil gravity, Standard model Tinseth or Rager IBUs, and extended model Flameout/Whirlpool/Hopstand IBUs (if applicable) simultaneously. Enter your desired post-boil OG in the Target OG cell at the bottom of the grain bill section, your desired standard model IBUs in the Target Standard Model IBUs cell at the bottom of the Boil Hops section, and your desired Flameout/Whirlpool/Hopstand IBUs (if applicable) in the Target Post-Boil contribution to Modified IBUs cell at the bottom of the Flameout/Whirlpool/Hopstand section. Then click in another cell (to move off of the Target IBUs cell), and click the ComboScale button. Tip: You may need to enable macros for the current workbook first.

## The Recipe Tab (cont.)

### Other Timed Boil Additions Section

Enter miscellaneous non-hop boil additions (e.g. yeast nutrient, whirlfloc, immersion chiller, etc.) here. The purpose is to remind you about the additions. Nothing in this section affects any computations.

### Flameout/Whirlpool/Hopstand Hops Section

This is where you enter hops that will be added at Flameout or for a Whirlpool/Hopstand. Enter here if you want them to affect the Modified IBU calculations. If you enter here, do *not* enter them in the boil hops section.

**Hop:** Select the hop variety from the dropdown.

**Type (L/P):** Select 'L' for Leaf, 'P' for Pellet, 'C' for Cryo, or 'E' for (CO<sub>2</sub>) Extract from the dropdown.

**Ounces (or Grams):** Enter the weight of the hop addition here.

**Avg Temp:** Enter the average temp of the wort during the time these hops will be in the wort. BrewCipher uses this information, along with other information, to compute the IBU contribution of these hops in the Modified Tinseth or Modified Rager IBU calculations. Enter this value in degrees Fahrenheit if using U.S. measurements or in degrees Celsius if using Metric. Tip: While chilling wort, the rate of temperature reduction slows down the lower you get, so during a chill your wort will spend much more time at the lower end than the higher.

**Minutes:** Enter the total number of Minutes these hops will be in contact with the wort.

**AA%:** Typical Alpha Acid % for the selected hop variety is displayed here. If your hops are different, enter the actual AA% in the AA% Override column.

**AA% Override:** If the Alpha Acid % of your hops is different from the value in the AA% column, enter the actual AA% here.

## The Recipe Tab (cont.)

### Flameout/Whirlpool/Hopstand Hops Section (cont.)

**+IBUs:** Displays unconstrained extended model IBUs. The Standard Tinseth and Rager formulas will not calculate any IBUs for these additions, and ignores these values. But the Modified Tinseth and Rager Models uses them.

**+IBUs:** To scale your current Flameout/Whirlpool/Hopstand hop bill up or down, enter the desired IBUs in the Target IBUs cell to the right, click in another cell (to move off of the Target IBUs cell), then click the Scale! button. Hop quantities will be automatically updated. Tip: You may need to enable macros for the current workbook first.

Note that when increasing hops, BrewCipher adds water (due to hop absorption) to maintain batch size. That extra water means even more hops to maintain the new bitterness level. BrewCipher cycles through this phenomenon iteratively to converge on the target. The natural result is a lower post boil Original Gravity. (Decreasing hops causes a similar phenomenon, but opposite.) If you want to scale your Flameout/Whirlpool/Hopstand hops while maintaining (or newly targeting) a certain post-boil Original Gravity and Boil Hop IBUs , use the ComboScale button located in the Boil Hops Section instead.

## The Recipe Tab (cont.)

### Dry Hops section

This is where you enter hops that will be added during or after fermentation. These hops do not affect any BrewCipher calculations.

**Hop:** Select the hop variety from the dropdown.

**Type (L/P):** Select 'L' for Leaf, 'P' for Pellet, 'C' for Cryo, or 'E' for (CO2) Extract from the dropdown.

**Ounces (or Grams):** Enter the weight of the hop addition here.

**Location:** Select a location from the dropdown (Primary, Secondary, Keg, or Other).

**Days:** Enter your planned number of days for the dry hop addition.

**Temp:** Enter the temperature of the beer at the time of the addition.

**Method:** Select a method from the dropdown (Hop Bag, Tea Ball, Commando, Hop Cage, Other).

### Yeast sections

**Yeast Strain:** Select your Yeast Strain from the Dropdown. BrewCipher uses this, along with other information, to predict attenuation and thus final gravity. If you need a Yeast Strain that's not listed, you can add it on the YEASTLOOKUP tab.

**Yeast Vials/Packs #:** Enter the number of liquid yeast smack packs or vials. If you are re-pitching slurry, delete any values in this (Yeast Vials/Packs #) cell. If there are values in both cells, the Slurry will be used and the Yeast Vials/Packs will be ignored. Both cells will be turned red as a reminder/warning. If using Dry Yeast (11.5g packs), you may need to change the Yeast Cells Per Fresh Package parameter on the Brewhouse Tab.

## The Recipe Tab (cont.)

### Yeast sections (cont.)

**ml Slurry:** If repitching harvested yeast, enter the number of milliliters of slurry you have. (If not repitching harvested yeast, this cell should be blank.) If you are using Slurry, delete any value in the "Yeast Vials/Packs #" to the left. If there are values in both cells, the slurry will be used and the packs/vials will be ignored. Both cells will be turned red as a reminder/warning. If the amount of cells in the slurry is sufficient for the batch, the answer in the Yeast Starter block below will indicate how much of the slurry to use. If the amount of cells in the slurry is not sufficient for the batch, the starter volume(s) will be calculated the same way as an equal cell count coming from full/partial/multiple pack(s)/vial(s) of yeast.

**Days Old:** Enter the number of days since the yeast vial(s)/packet(s) was packaged or since the batch from which the yeast slurry was harvested was fermented. If the yeast has been rinsed, enter the number of days since rinsing.

**Viability:** BrewCipher computes the viability (estimated percentage of yeast cells still alive) based on the Days Old and on the Yeast Age Death Rate per Day parameter, and displays it here.

**Override Viability:** If you know your yeast viability is different from the result of the age-based yeast cell viability calculation, select a percentage from the dropdown list. Otherwise, leave blank.

**Fermentation Temp:** Enter your planned fermentation temperature here. This entry does not affect any BrewCipher calculations.

## The Recipe Tab (cont.)

### Post Boil / Post Fermentation Input section

In this section, you can enter gravity and post boil volume measurements, and BrewCipher will compute your actual Mash Efficiency, Attenuation, and ABV. You can also use this section as a standalone ABV calculator by entering an OG and an FG (ignoring the volume input and the Mash Efficiency output). Entering data in this section is optional, and is not used in other BrewCipher calculations.

**OG (or OG (P)):** Enter your measured post-boil Original Gravity. If you selected “Plato” as your gravity measurement system, enter this OG in degrees Plato. Otherwise, enter as a Specific Gravity.

**Post Boil Kettle Vol:** Enter the actual Volume of Wort in the Kettle at the end of the boil after cooling (*not* the volume that made it into the fermenter). Enter in gallons if using U.S. measurements or in liters if using Metric.

**FG (or FG (P)):** Enter your measured (post-fermentation) Final Gravity. If you selected “Plato” as your gravity measurement system, enter this FG in degrees Plato. Otherwise, enter as a Specific Gravity.

**Achieved Mash Efficiency:** Based on the OG and Post Boil Kettle Volume inputs above, BrewCipher displays your actual mash efficiency here.

**Achieved Apparent Atten:** Based on the OG and FG inputs above, BrewCipher displays your actual achieved apparent attenuation here.

**Achieved Traditional ABV:** Based on the OG and FG inputs above, BrewCipher displays ABV here, using the standard ABV calculation.

**Achieved Alternate ABV:** Based on the OG and FG inputs above, BrewCipher displays ABV here, using the alternate ABV calculation. This ABV formula was supposedly more accurate than the traditional formula, especially at higher ABV levels. However, recent ABV measurements by at least two professional breweries have cast doubt on this formula. It's still included for users who like it.

## The Recipe Tab (cont.)

### Outputs section

This section displays most of the BrewCipher outputs pertaining to the recipe. For output attributes that have BJCP guidelines (Gravity, ABV, SRM, IBUs), BrewCipher will indicate if the current result is outside the guideline ranges.

**Yeast Starter:** BrewCipher automatically calculates recommended yeast starters, based on the type of beer (Ale, Lager, or Hybrid), the recipe's OG, the amount and viability of the yeast you are starting with, and whether or not you use a stir plate. It automatically recommends multi-step starters (up to 3 steps) where appropriate, including number of steps, size(s), amount(s) of DME, and amount(s) of (Wyeast) yeast nutrient. If you get an error here, it's because the amount of viable yeast cells is not enough to get sufficient cells for the batch, even with a 3 step starter. Tip: there are several "set and forget" yeast starter parameters on the Brewhouse tab, including whether or not you use a stir plate.

**Strike Water:** BrewCipher displays the "Net" amount of water needed in the mash tun for the strike infusion, as well as the required temperature. It excludes any Hot Liquor Tank Deadspace. (The total (gross) amount of water to add to the HLT (if applicable) is shown on the far right.)

**Sparge Water:** BrewCipher displays the "Net" amount of water needed in the mash tun for the sparge, as well as the required temperature. The volume excludes any Hot Liquor Tank Deadspace. (The total (gross) amount of water to add to the HLT (if applicable) is shown on the far right.) Use this result if you are doing a sparge. For a "no-sparge" mashout, use the Mashout (no sparge) Water result below.

**Mashout (no sparge) Water:** BrewCipher displays the "Net" amount of water needed in the mash tun for the Mashout, as well as the required temperature. It excludes any Hot Liquor Tank Deadspace. (The total (gross) amount of water to add to the HLT (if applicable) is shown on the far right.) Use this result if you are not doing a sparge. If you are doing a sparge, use the Sparge Water result above.



## The Recipe Tab (cont.)

### Outputs section (cont.)

**Mash Average Diastatic Power (Deg L):** BrewCipher displays the weighted average diastatic power (DP) of the mash, which affects how completely the starches are likely to be converted to sugars and unfermentable dextrins. It reflects the amount of enzymes contributed by the grains, and depends on the grain types and proportions. A DP of 35 Deg L (Degrees Lintner) is often quoted as a minimum for full conversion. However, there are other factors, such as the length of the mash. It's possible to get full conversion with less than 35 Deg L with a longer mash. Also displayed is an assessment of the result. DP of above 35L is considered to be "good," 25L-35L to be "marginal," and below 25L to be "poor." This is a simplification of a complex process. Experience will tell you what works and doesn't work in your system and process.

**Predicted Pre-Boil OG (or Plato):** BrewCipher computes and displays the predicted pre-boil gravity and volume of wort (including volume from non-mashed ingredients such as LME, DME, syrups, etc.

**Predicted Post-Boil OG:** BrewCipher displays the predicted post-boil gravity and volume of wort. Tip: The relationship between pre-boil gravity and post-boil gravity is a function of how much water boils/evaporates away. You don't have to understand that relationship deeply, but make sure to set the Boil Off per Hour parameter on the Brewhouse parameters tab appropriately.

**Predicted Apparent Attenuation:** BrewCipher displays the predicted attenuation. It will change as you change your grain bill and mash conditions. Relax, it's supposed to, even though it doesn't with commercial software. Tip: If you consistently get more attenuation than predicted (across many recipes), you can go to the Brewhouse tab and adjust the Attenuation Power Factor upward. If you consistently get less attenuation than predicted (across many recipes), you can adjust the factor downward.

## The Recipe Tab (cont.)

### Outputs section (cont.)

**Predicted FG (or Final Plato):** Using the predicted post boil gravity and the predicted apparent attenuation, BrewCipher calculates and displays the predicted final gravity.

**(traditional) Predicted ABV:** BrewCipher displays the result of the most commonly used ABV formula. It is commonly used because it is simple. It's fairly accurate at low ABVs, but understates higher ABVs. However, you may find it more convenient to refer to this one, because many brewers over many years have set their expectations about ABV according to this calculation.

**(alternate) Predicted ABV:** This ABV formula was supposedly more accurate than the traditional formula, especially at higher ABV levels. However, recent ABV measurements by at least two professional breweries have cast doubt on this formula. It's still included for users who like it.

**Predicted Standard (Tinseth or Rager) IBUs:** BrewCipher calculates predicted IBUs according to the standard Tinseth or Rager formula here, depending on which was selected on the Brewhouse tab. It also calculates IBUs using a modified Tinseth or Rager formula, below.

**Modified (Tinseth or Rager) Model IBUs:** BrewCipher's Modified Tinseth and Rager Models add (pre-boil) bitterness for First Wort Hopping, bitterness contributions for post-boil hop additions (modeled and extrapolated based on research by Mark G. Malowicki), limits the total possible IBUs to 110 (due to solubility limits), and splices a new utilization curve to the Tinseth and Rager curves for IBUs above 65, based on a fit of real (but limited) data. In addition, this value is also modified by the Hop Utilization Multiplier (Brewhouse parameter), which is applied before the other adjustments.

**Predicted SRM:** BrewCipher uses the Standard Reference Method of estimating beer color based on the grain bill and displays the result here.

## The Recipe Tab (cont.)

### Outputs section (cont.)

**Recommended Wort O2 Seconds:** BrewCipher calculates a recommended time to oxygenate the wort, based on Batch Size, Type (Ale, Lager, or Hybrid), and Gravity. It assumes using a common "hardware store" O<sub>2</sub> cylinder with a 0.5 micron sintered stone. I think this setup typically delivers approximately one liter per minute when immersed in a carboy.

**Recommended Lagering Days:** BrewCipher calculates a recommended number of lagering days for lagers, based on gravity.

**Mash Salts/Acids:** If any Mash Salts or Acids have been entered on the Water tab, they will be displayed here too.

**Sparge H<sub>2</sub>O Acid:** The Sparge Water Acidification result (amount and type of acid to use in the sparge water) from the Water tab is shown here, only if its indicator on the Water Tab is set to "Y".

**Kettle Salts:** If any Kettle Salts have been entered on the Water tab, they will be shown here too.

**BU/GU Ratio:** This is the computed ratio of IBUs (from the Standard Tinseth or Rager formula) to Original Gravity Points. Tip: Use this result as a general guide to the balance between Bitterness and Malty Sweetness. (If using Plato rather than Specific Gravity, the ratio displayed is BU/Degreed Plato.)

**Mod BU/GU Ratio:** This is the same computation as the normal BU/GU Ratio above, but uses the Modified Tinseth or Rager IBUs in place of the Standard Tinseth or Rager IBUs. (If using Plato rather than Specific Gravity, the ratio displayed is BU/Degrees Plato.)

# Building Recipes (cont.)

## The Water Tab

The Water Tab is where you will build your water profile for the recipe. It predicts mash pH based on your starting water, your grain bill, and your salt and/or acid additions. It also computes any acid addition needed to bring your sparge water to a desired pH value (if any). This tab also includes a "pH Target Picker Tool" that recommends a target pH based on desired beer characteristics. Tip: As with most areas in BrewCipher, the Water Tab is fully integrated with the recipe on your Recipe tab. However, if you don't care about water chemistry/pH/mineral profiles, you don't have to do anything at all on the water tab. It won't affect any of the calculated results displayed on the Recipe Tab.

### **Source Tap/Well Water (reported ions ppm) section**

This is where you enter the minerals from your water report. Generally, you can get this report from your local water authority. If not available, you can send a sample of your water to a lab such as Ward Laboratories and get a lab report of ions relevant to brewing for a reasonable fee. Your report may list ion concentrations in Parts Per Million (ppm) or in Milligrams per Liter mg/l. These units are interchangeable. Tip: If  $\text{SO}_4$  is listed as " $\text{SO}_4\text{-S}$ " or " $\text{SO}_4$  as S," multiply the water report number by 3 before entering in the  $\text{SO}_4$  cell. Tip: If your report lists Alkalinity as  $\text{CaCO}_3$  (and not  $\text{HCO}_3$ ), multiply the  $\text{CaCO}_3$  number by 1.22 and enter in the  $\text{HCO}_3$  cell.

### **Source Water pH**

Enter the pH of your source water from your water report. It is used in the sparge water acidification calculation. (It is not used in the mash pH calculations, where other factors make the source water pH irrelevant.)

## The Water Tab (cont.)

### **Strike Water and Sparge Water sections**

These sections display the Strike Water and Sparge (or Mashout) Water volumes from the recipe tab, and allow you to input what percentage of your Strike and Sparge water is Distilled (or RO) water. Tip: Some brewers build their brewing water up from distilled/RO water because it allows them to start with a clean slate. Others dilute their hard tap/well water with distilled/RO water to bring the brewing ion concentrations into manageable ranges. If you are not using any Distilled/RO water, be sure to specify 0%.

### **Show % of Distilled Water on Recipe and BrewDay Tabs?**

If you want to display the percentage of distilled water on the Recipe and Brewday Print Me tabs, select 'Y' from the dropdown here. The reason for this parameter ('N' by default) is that for users who don't use the Water tab, showing its data on the other tabs would be irrelevant and potentially confusing.

### **Grist Section**

This section displays grain bill information from the Recipe for reference. pH Calculations are done "behind the scenes" by the MpH water models developed by Utahbeerdude of the Beer Advocate homebrewing forum. See his blog at <http://homebrewingphysics.blogspot.com/> for white papers and the original spreadsheet, MpH Calculator. The white papers are highly recommended reading.

## The Water Tab (cont.)

### Salt Additions section

In this section, enter amounts of salts (in grams) that you'll add to the Mash and to the Kettle. (There is no reason that the two need to be the same or proportional.) Salts added to the mash will affect both the mash pH and flavor (except NaCl, which only affects flavor). Salts added to the kettle will affect flavor. Note that the words 'Sparge' and 'Kettle' (when concerning mineral salt additions) are often used interchangeably. Sparge/Kettle salts should normally be added to the Kettle rather than to the sparge/mashout water. You'll see the results of your salt additions in the Water Results section, in the Chloride to Sulfate Ratio, and in the mash pH.

**CaCl<sub>2</sub>:** Calcium chloride. Lowers mash pH and affects flavor. When adding to the mash to lower pH, consider the Chloride to Sulfate Ratio and its impact on flavor. pH can also be lowered with CaSO<sub>4</sub> (Gypsum), with a different flavor result, or with Acid additions, with little flavor impact.

**CaSO<sub>4</sub>:** Calcium sulfate (Gypsum). Lowers mash pH and affects flavor. When adding to the mash to lower pH, consider the Chloride to Sulfate Ratio and its impact on flavor. pH can also be lowered with CaCl<sub>2</sub>, with a different flavor result, or with Acid additions, with little flavor impact.

**MgCl<sub>2</sub>:** Magnesium chloride. Lowers mash pH and affects flavor. Tip: Beer wort naturally contains more Magnesium than the yeast need. Consider using CaCl<sub>2</sub>, CaSO<sub>4</sub>, or Acids to lower mash pH instead.

**MgSO<sub>4</sub>:** Magnesium sulfate (Epsom Salts). Lowers mash pH and affects flavor. Tip: Beer wort naturally contains more Magnesium than the yeast need. Consider using CaCl<sub>2</sub>, CaSO<sub>4</sub>, or Acids to lower mash pH instead.

**NaCl:** Sodium chloride (Table Salt). Does not affect mash pH, but affects flavor. Therefore if it's used, it's more suitable as a kettle addition than as a mash addition.

## The Water Tab (cont.)

### Salt Additions section (cont.)

**NaHCO<sub>3</sub>**: Sodium Bicarbonate (Baking Soda). Raises mash pH and affects flavor.

**Ca(OH)<sub>2</sub>**: Calcium hydroxide (Slaked Lime, aka pickling lime). Raises mash pH and affects flavor.

**Chalk**: Forget it. It doesn't dissolve well in the mash and is a terrible way to raise pH. Not supported.

### Water Results section

This section displays the achieved concentrations of brewing ions for both the mash strike water and the kettle/sparge portions of your water, and for the total combined water. The results here are based on your starting water profile, how much (if any) of the water was distilled/RO water, and what/how much salts were added. (Salts dissolve, i.e. dissociate into their component ions, so the results displayed are for individual ions.) At the bottom of the water results section, there is a dropdown box, which may contain one or more suggested water profiles, based on beer style, and any user water profiles you may have stored in the User H<sub>2</sub>O Profiles Tab. You can use one of these suggested profiles as a target/reminder when building your water profile for the current recipe.

**Show Water Concentration Results and mash pH on BrewDay Tab?** : This cell determines whether the water results and the predicted mash pH are also displayed on the Brew Day Print Me tab. The reason for this parameter ('N' by default) is that for users who don't use this part of the Water tab, showing its data on the Brew Day tab would be irrelevant and potentially confusing. If you do want the displays to be carried over to the other tab, select 'Y' from the dropdown here.

## The Water Tab (cont.)

### Mash Acid Additions section

Use this section to add an acid to the mash to lower the predicted pH. Tip: Acid additions generally have less impact on flavor than mineral additions, so if your brewing ions are already where you want them, but the predicted mash pH is too high, acid additions are the way to go.

**Phosphoric:** Phosphoric acid is readily available in a 10% strength. If the strength of your phosphoric acid is different, enter it in the Strength row. On the Amt (ml) (oz for Malt) (or Amt (ml) (g for Malt)) row, you can enter an amount for Phosphoric Acid in milliliters (ml) until you achieve your desired predicted mash pH.

**Lactic:** Lactic acid is readily available in a 88% strength. If the strength of your lactic acid is different, enter it in the Strength row. On the Amt (ml) (oz for Malt) (or Amt (ml) (g for Malt)) row, you can enter an amount for Lactic Acid in milliliters (ml) until you achieve your desired predicted mash pH.

**Acid Malt:** If you are a traditionalist, you can also lower mash pH by using acid malt, which is typically a pilsner malt coated with lactic acid. 3% strength is the default for acid malt. If you know yours to be different, enter it in the Strength row. On the Amt (ml) (oz for Malt) (or Amt (ml) (g for Malt)) row, you can enter an amount for Acid Malt in ounces (or grams if using Metric measurements) until you achieve your desired predicted mash pH. *Note: If you use acid malt in your grist, enter it here, even if you also entered it in your grain bill on the recipe tab.* Tip: Adjusting mash pH with an Acid Malt is less precise than with acid solutions.

### Chloride to Sulfate Ratio

BrewCipher displays the ratio of Chloride to Sulfate achieved by the water profile built. Ratios greater than 1.0 tend to accentuate malt flavors. Ratios less than 1.0 tend to accentuate crisp bitterness.



## The Water Tab (cont.)

### Mash pH

Predicted Mash pH is computed and displayed here, based on the starting water profile, grain bill, mash salt additions, and acid additions. Ideally, mash pH should be in the range of 5.4 to 5.6, measured at room temperature.

### Sparge Water Acidification section

If you want to acidify your sparge water (in order to prevent extraction of astringent tannins during the sparge), enter the desired sparge water pH. The amount of phosphoric acid or lactic acid needed to acidify your sparge water to the target pH is displayed. Tip: The risk of tannin extraction is generally highest when fly sparging.

### pH Target Picker Tool

This standalone tool can help you choose a target pH, based on a tradeoff of desired beer characteristics:

**Maintain Palest Color?:** If the palest possible color is important, select “Y.” If not, select “N.”

**Desired Body:** Select “High” for a full body, “Low” for a light body, or “Medium” for something in between.

**Hop Forward?:** Select “Y” for a hop forward beer (e.g. a traditional IPA) or “N” for a not hop forward beer (e.g. a typical Stout).

**Haze Desired?:** Select “Y” for a hazy beer (e.g. a NEIPA), or “N” for a very clear beer (e.g. a Kolsch).

**Recommended pH:** The formula calculates a recommended pH target based on the above inputs.

# Building Recipes (cont.)

## The User H<sub>2</sub>O Profiles Tab

You can store your own target water profiles on the User H<sub>2</sub>O Profiles tab. For each profile, enter a Name (e.g. "Burton Water" or "Billy Bob's Excellent Stout Water") in the Profile Name Column. Enter the parts per million for Calcium (Ca), Magnesium (Mg), Sodium (Na), Chloride (Cl), Sulfate (SO<sub>4</sub>), and Bicarbonate (HCO<sub>3</sub>) in their respective columns. Profiles you have entered on this tab will be available in the dropdown in the Water Results section of the water tab. Note: Profiles added to this tab are not recognized when running BrewCipher in Apache OpenOffice.

# Building Recipes (cont.)

## The Step Mash Tab

The Step Mash Tab is where you will build your mash schedule if you are planning to do a multi-step infusion mash. (For a single infusion mash with a sparge or mashout, do not use this tab. The inputs/outputs needed will be on the Recipe Tab.) Some information on the Step Mash Tab is carried over from the Recipe Tab or Brewhouse Tab, but it can be overridden. By using the overrides, this tab can also be used as a standalone multi-step infusion calculator.

### Recipe Inputs/Overrides Section

**Recipe Grains (Lbs or kg):** Displays the total grain weight from the grains section of the Recipe Tab. To override, enter the weight in **Override Grains**.

**Total Recipe H2O (Gal or Liters):** Displays the total water volume for the recipe. To override, enter the weight in **Override H2O**.

**Temp (F or C) Loss per Hour:** Carried over from the Brewhouse Tab. To Override, enter the hourly temperature loss in **Override (F or C) Loss per Hour**.

**Grain and Tun Temp (F or C):** The Ambient Grain and Tun Temp from the Recipe Tab. To override, enter the Temperature in **Override Grain & Tun Temp**.

**Strike Water to Grain Ratio (qts per lb or liters per kg):** Carried over from the Recipe Tab. To override, enter the desired ratio in **Override Ratio**. Note that multi-step infusion mashes often need lower Strike Water to Grist Ratios than typical single infusion mashes, so that all the steps can be conducted within the available water volume. BrewCipher will warn if the ratio is too high, given the rest of the desired steps.

**Mash Tun Equiv H2O Vol (quarts or liters):** Carried over from the Brewhouse Tab.

## The Step Mash Tab (cont.)

### Rest Inputs Section

The Rest Inputs Section is where you'll input target rest temperatures and lengths for each step (rest).

**Target Temp (F or C):** For each rest, input the desired mash temperature.

**Length (minutes):** For each rest, input the planned length of time.

**Skip?:** Rest 2 and/or Rest 3 can be bypassed if desired, in which case the next rest will start where the last non-skipped rest left off. Enter a "Y" to skip or an "N" to include.

### H<sub>2</sub>O Infusions Section

The H<sub>2</sub>O Infusions Section is the output section, i.e. the multi-step infusion mash "answers."

**Infusion Temp (F or C):** For each rest, this is the temperature of the water needed to achieve the desired rest temperature. For Rest 1, it's like the Strike Water Temperature in a single infusion mash. For Rest 4, if the infusion temperature would need to be greater than boiling, BrewCipher will provide a warning along with a suggestion to reduce the Strike Water to Grain Ratio to compensate. Alternatively, you could increase boil time, which would increase the water needed.

**Infusion Vol (Gal or Liters):** For each rest, this is the volume of water at that step's infusion temperature needed to settle at the desired rest temperature. For Rest 4, this volume will always be the remaining water needed by the recipe. If there is not enough recipe water to achieve all the desired rest temperatures, BrewCipher will provide a warning along with a suggestion to reduce the Strike Water to Grain Ratio to compensate. Alternatively, you could increase boil time, which would increase the water needed.

# Refractometer Calculator

## The Refractometer Tab

The Refractometer Tab is a calculator that converts your refractometer brix readings into specific gravity values and computes ABV. When using a refractometer, a calculator is needed because refractometers are designed to read the content of a single sugar in a solution, not the mix of sugars found in beer wort. It's also needed because the presence of alcohol affects the refractive index of the solution. The calculator corrects for both of these issues.

The Brix to Specific Gravity calculation was developed by Sean Terrill. See the Refractometer Tab for licensing information and for links to Sean's original work.

## Wort Parameters section

The calculator applies a Wort Conversion Factor (WCF), which accounts for the fact that sugars/dextrins other than sucrose have a different refractive index than sucrose. The (recommended) Wort Correction Factor (WCF) is computed using the expected attenuability from the recipe on the recipe tab. The formula that calculates this recommended WCF was derived by me, using two pieces of data... First, Sean Terrill's work, which found that a WCF of 1.04 is a good center for worts with an average ADF of 81%. Second, that a pure sucrose solution would require no WCF, i.e. a factor of 1.0. This recommended WCF calculation is not necessarily endorsed by Sean, whose shadow I merely walk in. If you are uncomfortable applying this WCF derived using expected attenuability, you can apply an override. Sean Terrill's recommended default (based on the worts he tested) is 1.04.

## Refractometer Readings and Conversions to Specific Gravity (or °Plato) section

Enter your Original °Brix and Final °Brix refractometer readings here. The calculator will convert and correct these to Original Gravity and Final Gravity values and calculate apparent attenuation and ABV.

# Hydrometer Temperature Correction Calculator

## The SG Correction Tab

The SG Correction Tab is a calculator that adjusts your hydrometer readings taken at wort/beer temperatures other than the temperature at which the hydrometer was calibrated. This is needed because the density of liquids changes when the temperature changes.

### Input section

**Hydrometer Calibration Temperature:** Enter the calibration temperature of your particular hydrometer. Most homebrew hydrometers are calibrated at 60F or 68F. And other calibrations are possible. Check the documentation that came with your hydrometer. It may also be printed on the piece of paper inside the hydrometer. If using Metric measurements, enter in degrees C. Otherwise, enter in degrees F.

**Wort Temperature:** Enter the temperature of your wort at the time of the hydrometer reading to be corrected. If using Metric measurements, enter in degrees C. Otherwise, enter in degrees F.

**Hydrometer Reading:** Enter the hydrometer reading to be corrected. If using the Plato scale, enter in degrees Plato. Otherwise, enter as a Specific Gravity.

### Output section

**Corrected Hydrometer Reading:** Displays the calculated corrected hydrometer reading, in degrees Plato or as Specific Gravity (depending on the gravity measurement system selected on the Brewhouse parameters tab).

# Brew Day Printout and NotePad

## The Brewday Print Me Tab

The Brewday Print Me tab displays the relevant information you'll need to make your yeast starter, prepare brewing water, and brew your recipe. Most of the information on this tab is linked from other information in the workbook. Its purpose is to provide more of a "step by step" process view than you would get by simply printing the Recipe and/or Water tabs.

## The NotePad Tab

The NotePad tab is simply a place for you to record miscellaneous notes about your beer before, during, and/or after brew day. It's formatted as a series of rows (one row per note) that fits neatly on a single page if printed. Tip: Use this tab to record notes about anything that didn't go quite according to plan, tasting notes, and things you would change the next time you make this recipe.

# Carbonation

## The Carbonation Tab

This tab contains calculations for both Bottle Priming and Kegging (forced CO<sub>2</sub>).

### **Bottle Priming section**

This section is for carbonating in the bottle with priming sugar. Note: Over-carbonated bottles are dangerous. Do not carbonate to levels higher than your particular bottles are designed to handle. Disclaimer: Use common sense. If the calculator tells you to use an amount of sugar that does not seem reasonable, double check with another calculator. The author assumes no responsibility for inaccuracy, malfunction, or misuse.

**Recommended Volumes of CO<sub>2</sub>:** BrewCipher recommends a level of carbonation based on the style of the beer that's on the recipe tab, and displays it here.

**Override Volumes of CO<sub>2</sub>:** If you want to carbonate to a level different from the recommended level, enter it here. Otherwise BrewCipher will use the recommended level.

**Beer Volume:** Enter the volume of beer to be carbonated here, in gallons if using U.S. measurements or in liters if using Metric.

**Beer Temperature:** Enter the temperature of your beer *at the end of active fermentation, or the temperature at bottling, whichever is higher*. Enter in degrees F if using U.S. measurements or in degrees C if using Metric.

**Sugar Type:** Select your type of priming sugar from the dropdown box.

**Sugar Weight to Use:** This is the bottle priming calculation's answer. Use this amount of priming sugar.



## The Carbonation Tab (cont.)

### **Kegging (forced CO<sub>2</sub>) section**

This section is for carbonating in the keg with forced CO<sub>2</sub>. Never exceed the pressure rating of your keg.

**Recommended Volumes of CO<sub>2</sub>:** BrewCipher recommends a level of carbonation based on the style of the beer that's on the recipe tab, and displays it here.

**Override Volumes of CO<sub>2</sub>:** If you want to carbonate to a level different from the recommended level, enter it here. Otherwise BrewCipher will use the recommended level.

**Beer Temperature:** This is the temperature of your beer *while you carbonate*. Normally this would be equal to the average *actual* air temperature of your refrigerator/kegerator/keezer. This temperature may be different from your refrigerator/kegerator/keezer's thermostat temperature setting. If you will be carbonating at room temperature, enter that temperature. Enter in degrees F if using U.S. measurements or in degrees C if using Metric.

**CO<sub>2</sub> PSI to Use:** This is the kegging calculation's answer. It's the CO<sub>2</sub> regulator setting you'll need to use to carbonate to the desired CO<sub>2</sub> level, given the specified temperature.

**Beer Line Type:** Select the type of beer (liquid) line used in your kegging setup.

**Faucet Hgt. above Mid of Keg:** Enter the vertical distance between the middle of your keg height and your faucet.

**Beer Line Length to Use:** BrewCipher computes the length of beer line required to balance the keg system, based on the CO<sub>2</sub> PSI, the type of beer line, and the height of the faucet above the middle of the keg. If this length is producing too much foam or not enough foam, see the Beer Line Resistance Multiplier parameter on the Brewhouse Tab.

# Adding Fruit

## The Fruit Calc Tab

This tab is a calculator that you can use to predict the change in total effective Original Gravity, Final Gravity, and ABV when adding fruit, fruit puree, or juices to a primary or secondary fermenter. Contrary to popular belief, adding fruit does not always increase OG and/or ABV. It depends on the base beer/wort and what type of fruit you're adding. This calculator also includes "Water" as a potential addition, so it can be used as a dilution calculator as well.

By default, the calculator assumes all of the water and soluble carbs (including sugars) from the fruit/puree/juice(s) homogenize with the base beer/wort. It makes no assumption about how much of this homogenized mixture remains entrapped by fruit solids, i.e. there are no predictions about final usable volume.

### **Base Beer (from recipe sheet) section**

This section displays some information from your original recipe (the recipe currently on the recipe tab). This includes Post Boil OG, Volume, and Apparent Attenuation. BrewCipher uses this information as the starting point to which you'll add fruit/puree/juice(s). If desired, you can override any of these starting values in the blue input boxes.

### **Fruit Assumptions (optional advanced parameters) section**

This section is intended for advanced users.

**Fruit Sugar Fermentability:** By default, BrewCipher assumes that the sugars in fruit (but not the non-sugar carbs) are 100% fermentable, i.e. 100% real (not apparent) attenuation. Leave this value at 100% unless you have a reason to change it.

## The Fruit Calc Tab (cont.)

### **Fruit Assumptions (optional advanced parameters) (cont.)**

**Fruit Homogenization with Beer:** This is the extent to which the liquid from the fruit will mix with the beer. Leave this value at 100% unless you believe there will be liquid in the fruit that will not be reached by the beer. Note: even at 100%, some of the mixture will likely remain behind in the fruit when racking, but it still fully mixed, thus "100%."

### **Fruit Additions section**

In this section, you can add up to 3 fruits/purees/juices. Select them from the *Fruit 1/Fruit 2/Fruit 3* dropdown box(es). For each addition selected, type an amount into the corresponding *Amount* box, and specify the units(s) (Lbs or Gallons if using U.S. measurements) in the *Unit* box(es).

You can also add "Water" here to use this tab as a dilution calculator. And to use the tab as an additional boil-off calculator, enter Water as a negative value.

### **Result section**

This section displays the resulting predicted values using the data from the base beer/wort and the fruit/puree/juice(s). These values include *Combined Effective OG*, *FG*, *Apparent Attenuation*, and *ABV*.

# Mash Efficiency Prediction

## The Mash Efficiency Predictor Tab

This tab is a calculator that you can use to predict the change in mash efficiency that would result from increasing or decreasing the size of the grain bill and/or changing from a batch sparge to a no-sparge (or vice versa).

### **Baseline Data From Original Recipe section**

This section displays some information from your original recipe (the recipe currently on the recipe tab). BrewCipher uses this information, including the mash efficiency you had entered on the recipe tab, to estimate the new mash efficiency you would get if you increased or decreased the size of the grain bill and/or changed from a batch sparge to a no-sparge (or vice versa). *Tip: Having an accurate baseline mash efficiency is key.* Note that BrewCipher assumes that the original water to grain ratio for the mash will remain unchanged. This is because changing that ratio could itself change the conversion efficiency in a way that there is no data to model. Thus BrewCipher assumes no change to conversion efficiency, and bases the predicted changes in mash efficiency based on the changes in wort volumes and sugar concentrations that result from the changes in grain bill size and/or sparge method. BrewCipher also assumes a constant batch size here.

### **I want to convert based on...**

From the dropdown, choose the sparge types for your original recipe and for the batch for which you want to predict mash efficiency. There are four choices: “No-Sparge to No-Sparge,” “Sparge to Sparge,” “No-Sparge to Sparge,” and “Sparge to No-Sparge.” Example: Select “No-Sparge to Sparge” if your original batch was No-Sparge, but the batch you want to predict will be Sparged.

## The Mash Efficiency Predictor Tab (cont.)

### **Pounds (or Kilograms) of Grains for Efficiency Simulation**

Enter the weight of the grain of the batch for which you want to estimate mash efficiency. Enter this value in Pounds if using U.S. measurements or in Kilograms if using Metric.

### **Simulated Mash Efficiency with new Grain Weight and/or Sparge/No-Sparge Type Conversion (if applicable):**

This section displays the predicted mash efficiency for the new batch. If you see a message about negative sparge water volumes, it's because in order to maintain the same mash thickness (water to grain ratio), the sparge or mashout volume would have to be "negative" to mathematically reach the total water needed for the batch. In other words, maintaining the same mash thickness would have caused the batch to produce too much wort.

# Adding Ingredients to BrewCipher

There are three tabs in BrewCipher that contain information about brewing ingredients (fermentables, hop varieties, and yeast strains). If you are building a recipe and can't find the ingredient you want on the dropdown lists, you can add your ingredient to one of these ingredient tabs. Only enter information in the blue cells, and note that ingredients entered outside the specified ranges will be ignored.

## The GrainLookup Tab

This tab is for malts, sugars, extracts, and any ingredient that affects the original gravity of the wort. When adding an ingredient here, it's important to enter accurate/reasonable information about it, so that the models in BrewCipher can provide the best results. *Changing names of existing grains is not recommended; the MpH model uses very specific data for some specific grains.*

**Grain:** Enter the name of the grain or other ingredient in this column.

**PPG:** Enter the Points per Pound per Gallon here. This information can often be derived from a malt manufacturer's spec sheet or a vendor's website.

**Extraction affected by Mash Efficiency?:** Enter "y" for ingredients that go into the mash or for grains that are steeped. Enter "n" for extracts (i.e. pre-mashed ingredients) and sugars/syrups/honeys.

**Basic Attenuation:** BrewCipher uses this value in its grist attenuability calculations. Either copy this factor from another, *very similar*, ingredient or, if in doubt, message VikeMan on Beer Advocate.

**Attenuation Affected by Mash Cond?:** Enter "y" for ingredients that go into the mash or for grains that are steeped. Enter "n" for extracts (i.e. pre-mashed ingredients) and sugars/syrups/honeys.

**Lovibond:** Enter the Lovibond color of the ingredient. This information can often be found on a malt manufacturer's spec sheet or a vendor's website.

## The GrainLookup Tab (cont.)

**DP:** Enter the Diastatic Power (DP) of the ingredient in degrees Lintner. This information is often available on a malt manufacturer's spec sheet or website. Tip: Ingredients that are not malts always have a DP of 0, as do crystal malts and extracts.

**pH Type (Base, Wheat, Crystal, Roasted, or 0 for non mashed ingredients):** Enter the type of ingredient from a mash pH perspective here. There are 5 possibilities:

**Base:** In this context, "base malt" means any ingredient that is not a caramel/crystal malt, not a wheat/spelt grain/malt, not a dark Toasted or Roasted Malt, and not a non-mashed ingredient. Enter a 'B' for Base.

**Wheat:** Any malted or unmalted wheat or spelt, with the exception of roasted wheat/spelt. Enter a 'W' for Wheat.

**Crystal:** Any crystal or caramel malt. Enter a 'C'.

**Toasted:** Malts greater than 10L that are not Crystal/Caramel or Roasted. Enter a 'T'.

**Roasted:** Roasted includes Chocolate malts, Black Malts, Roasted Barley, Carafo Malts, and Roasted/Black Wheat malts. Enter an 'R'.

**0 for non mashed ingredients:** 0 is for any ingredient that can't normally be used in a mash. It includes extracts (which have been mashed before you buy them) and sugars/syrups/honeys. Enter a (numeric) 0.

**Dissolved Gallons per Pound for non mashed/non steeped ingredients:** See note in column header on GRAINLOOKUP tab.

Tip: You can sort your grains any way you want, but only sort the rows with blue cells. Bonus Tip: Add your grains in a different font color to make it easier to copy them into later versions of the spreadsheet when released. You can sort by color in your old version, then copy/past your own block of ingredients into the new version, and finally re-sort by name or whatever column you want.

# Adding Ingredients to BrewCipher (cont.)

## The HopLookup Tab

This tab is for hops. When adding an ingredient here, it's important to enter accurate/reasonable information about it, so that the models in BrewCipher can provide the best results.

**Hop:** Enter the name of the Hop variety in this column.

**Default Alpha Acid %:** Enter the typical alpha acid percentage for the hop variety. Tip: This information is often available on the vendor's website. By default, BrewCipher uses this Alpha Acid percent for the hop. However, it's very common for the Alpha Acid percentage for a given hop supplier and harvest to be different from the default. In that case, you can either change the percentage here or in the "AA% Override" cells on the recipe tab when building a recipe that includes the hop variety.

Tip: You can sort your hops any way you want, but only sort the rows with blue cells.

Bonus Tip: Add your hops in a different font color to make it easier to copy them into later versions of the spreadsheet when released. You can sort by color in your old version, then copy/paste your own block of hops into the new version, and finally re-sort by name.



# Adding Ingredients to BrewCipher (cont.)

## The YeastLookup Tab

This tab is for yeast strains. When adding an ingredient here, it's important to enter accurate/reasonable information about it, so that the models in BrewCipher can provide the best results.

**Yeast Name:** In this first column, enter the name of the yeast strain.

**Yeast Strain Attenuation Factor:** This factor is critical for the BrewCipher's attenuation model. The number will *not necessarily* resemble the yeast strain's published attenuation range, so manufacturers' specs are not much help here. It's simply a factor that works with other factors in the attenuation model to predict attenuation for the recipe. Tip: Find a yeast strain already on the list which in your experience produces approximately the same level of attenuation, and copy the factor from that strain. If in doubt, message VikeMan on Beer Advocate.

**Strain Type:** In this third column, enter the type of yeast strain: A=Ale, L=Lager, H='Hybrid' (e.g. Kolsch, Cali Common)