BASIC BEER FORMULIZATION

By Ernie Spreen   (June 2006)

Books and the Internet abound with recipes that do not always yield the desired results. I am not implying that these are bad recipes, but they are tailored to the brewing system and tastes of the writer, not those of the reader. To develop a personal recipe, one must begin with an understanding of one's own system. This example assumes all-grain brewing, but many of the principles apply to extract brewing as well.

We will begin at the end of the process: If you want a final yield of five gallons, how much wort must you put into your fermenter? If you filter, you would only need slightly over five gallons, losing only spillage and removed system losses. If you do not filter, you may require 5.5 gallons to cover the amount lost with yeast.

For our example, we will use 5.5 gallons. How much wort will we need in the kettle to yield 5.5 gallons? First, we estimate what will remain as trub and inaccessible fluid. Let us assume that we are boiling in a cut out Sanke keg and lose 0.5 gallons. We will have to design our recipe for 6 gallons of beer. What will go into the kettle initially as liquid will also include what will evaporate during the boil (about one gallon per hour).

If your goal is to accurately double or triple your output, you cannot simply double or triple your ingredients. You must recalculate. Continuing with our example, let us propose a 1.050 final gravity and calculate grain requirements. To do this, we must have an understanding of our system's efficiency. This can vary depending on equipment, type of mash, brewer, etc. Our assumption will be 75%. We will assume that 35 units of sugar (gravity) can be extracted from each pound of grain. Our calculation is as follows:

Target Volume x Target Gravity* = Total Gravity

6 gallons x 50 = 300 sugar units needed

$\dfrac{\text{Total Gravity}}{35 \text{ units / pound}} \div \text{Efficiency} = \text{\# pounds required}$

$\dfrac{300}{35} \div 0.75 = 11.4$

*using only the digits past the decimal point of the specific gravity reading.

Malt selection and amounts can be determined by applying the same percentages for a published recipe to your total requirement.

I personally prefer to err on the high side of gravity and add water, rather than boil the bejesus out of the wort if gravity is too low. The latter will affect hip utilization, therefore bitterness.

We should also consider the amount of hops to use. Your recipe will give you the number of IBUs (International Bittering Units) for the style. This is calculated as follows:

$\dfrac{\text{Ounces of hops x AA x Utilization}}{1.34 \text{ x Gallons}} = \text{IBUs}$

AA = Alpha Acid rating of the hops
Utilization = a function of wort gravity and length of boil for each hop variety used.
1.34 = a constant (to correct for our use of ounces vs. the IBU based on grams.

One of the easiest references for hop utilization is **The Brewer's Companion** by Randy Mosher, H.B. See also, **Designing Great Beers** by Ray Daniels.

To conclude, it all begins with knowing how much wort is required. Keep good notes to fine tune the knowledge of your system. Don't forget the yeast!