CALCULATING BREWHOUSE EFFICIENCY by Mike Retzlaff

For too many years I got in line with what the "experts" who wrote the books said. They told me that I should expect a gravity of 1.028 per pound of this malt and 1.030 per pound of that. For other grains it was higher or lower. These numbers apparently came from the average home-brewer's experience. However, none of us brew with identical procedures or even use the same equipment . . . we're like snowflakes.

As my methods improved and to some degree, my equipment was upgraded, I got better yields from my grain bill and decided that I could improve the predictability of my recipes by using more accurate data. To get away from what the experts said I should get for gravity, I started trying to figure out what the potential of each malt or adjunct actually is. I found this data on the tags on grain sacks, on malter's web sites, and from a few internet homebrew supply houses. Most of the time it will be listed as "extract - 79.5% coarse grind, 81% fine grind" or something of that sort. I still didn't understand how those percentages relate to points per pound per gallon (ppg) as we're taught to think. It finally dawned on me that the potential of that malted grain was in relation to something which is 100% fermentable. One thing that is 100% fermentable, at least in its pure state, is sucrose or table sugar. Sucrose yields 46.31 ppg when pure. If a malt is listed as 80% extract, then .8 X 46.31 = 37.048 or slightly better than 37 ppg. If the malt is 76% extract, then .76 X 46.31 = 36.19 or slightly better than 36 ppg. Remember, these are POTENTIAL extracts and are subject to brewhouse efficiency. Not even Anheuser-Busch, with all their computerized bells & whistles, gets 100% efficiency.

Brewhouse efficiency = realized gravity (OG) divided by [potential gravity/delivery to fermenter]. If we use the recipe from last time; 5# of Munich 10, 3# of 2 row, and 8oz. of Biscuit, we'll have a potential gravity of 305.95/5 gallons = 61.19 (1.061). If we deliver exactly 5 gallons of 1.046 gravity wort to the primary, we'll have a brewhouse efficiency of just over 75%. If we deliver 5.2 gallons of that same wort, we'll have a brewhouse efficiency of just over 78%.

It becomes a simple thing to plug these numbers into a spreadsheet (especially if you've already started one for beer color) to determine potential extract. When you finish brewing a batch of beer, you're already checking the gravity and volume delivered to the primary fermenter anyway. You can plug these numbers into your spreadsheet and determine the brewhouse efficiency of that particular batch. After several batches, you can figure an average for your brewing system. As you formulate subsequent recipes, you'll be able to hit your target gravity just about every time.

There are other calculations which can be made such as mash efficiency and lauter efficiency but brewhouse efficiency covers the overall performance of your system and is relatively simple to do. The real jewel of this is the ability to recognize the little things that make a big difference. If you get a higher or lower gravity than expected, it nudges you to go back over everything to determine what you did differently. If your gravity improved, what did you do to get more extract? If lower, what did you do to lose extract? Did you change the crush of your grains? Was there some difference in your mash regimen? Did you mash for 90 minutes instead of an hour? Did you rush the lauter and sparge or did you take your time collecting wort? There are many things which affect brewhouse efficiency but, for now, that discussion will have to wait.

Calculating brewhouse efficiency doesn't guarantee better beer but it does give you a place to start improving your brewing skills. You can just shrug shoulders and wonder why things didn't go as planned or use this tool to help figure it out. This is one of the allures of home-brewing . . . brewing better beer on a consistent and predictable basis.