MASH THICKNESS by Mike Retzlaff

Mashing is a bio-chemical reaction which actually turns your mash tun into a bio-reactor. When you stop to think about it, that's really impressive! Whether you use an ice chest, water cooler, kettle, or some other vessel to do the mashing, there are mechanical conditions to address as well as the bio-chemistry end of things.

In previous articles, we've gone over the role of temperature and pH in regards to mashing. This time the focus is on mash thickness.

Most brewers I know use the standard 1.25 quarts per pound mash ratio of brewing liquor to grist. Almost all of the brewing books cite this as the "proper" mash thickness. It will normally serve anyone well but what's "proper" depends on what kind of mash you're doing. Not all mashes are single infusion.

The size of your mash tun can be a factor. Should you be brewing a batch with a large grain bill, the tun might not be able to hold the grist and brewing liquor at the ratio you normally use. You might have to reduce the ratio, find a larger tun, or even use two tuns to handle the mash volume as is done with the club equipment at Brew Offs.

There are other mechanical considerations. As I've written before, I normally use step or program mashing. I have a motor driven mixer which keeps the mash moving while directly heating the kettle. The physics of keeping the mixer running in a really thick mash is not hard to imagine. The motor is not a high horsepower unit and bogs down if forced to work in too thick a mash.

RIMS and HERMS systems use pumps to circulate the mash between vessels. If the mash is too thick, the hoses will choke and the pumps can't do their job. I don't know what the minimum mash thickness is for these systems but it surely depends on the pump and hose size.

If you use a mash tun with a false bottom, you may run into another problem although it's a small one. How much water is under the false bottom? You really shouldn't include it in the liquor to grist calculation. Do a little test to see just how much water lurks under that false bottom. Write that measurement down somewhere for future reference. When you draw your mash liquor, add the extra water to it before heating to your strike temp. Otherwise, your mash will be thicker than you calculated. Manifolds don't isolate as much liquid.

A decoction mash presents a different problem. You need to physically scoop a portion of the mash into another vessel for heating. Even though decoctions usually call for pulling thick and thin portions of the main mash, it has to be loose enough to stir during heating to avoid scorching. Many texts indicate a ratio of 3.25:1 liters per kilogram or 1.56 quarts per pound as ideal for a decoction mash.

Really thick mashes can actually hinder enzyme activity. However, thick mashes provide thermal mass and protect the enzymes from premature denaturing due to "hot spots" in the mash from incomplete mixing.

The enzymes, once activated in the mash, have preferred conditions to perform at their best. Temperature, pH, and mash thickness all play a role in a first class mash regimen. The proteolytic enzymes, peptidase and protease, work best between 113^{o} and 131^{o} in a fairly thick mash. Peptase, during this rest, is an added bonus which can help to produce a brighter beer. Beta and alpha amylase work best at higher temps and prefer a thinner mash. Thinner mashes are generally considered better for the sake of brewhouse efficiency.

What are these thick and thin ratios?

- A thick mash is 1 qt. or less per pound of grain.
- A medium mash thickness is over 1 qt. per pound to about 1.9 qts. per pound.
- A thin mash is 2 qts. or more per pound.

So what do you do with this information? If you decide that you need a mash rest to degrade proteins, mash in at 1 qt. per pound. You can then do a step infusion to raise the temp to the next rest. This will automatically thin the mash as you proceed.

In a 5 gallon batch for example, let's start with 9# of crushed malt @ 75^{o}. We want a thick proteolytic rest of about 124^{o}. We'll heat 9 quarts of water to 136^{o} and stir in the grist. We now have a thick mash of 1 qt. per pound. After this 25 to 30 minute rest, we'll find that the enzymes are doing their job as the mash has loosened up quite a bit. By adding 5 quarts of boiling water, we'll raise the temp to 152^{o}. This will result in a mash ratio of 1.55 qts. per pound for our saccharification rest. Alpha & beta amylase work better in this thinner mash and it will still fit in a 5 gallon water cooler mash tun.

Many other mash scenarios can be adapted depending on our equipment and what we're trying to accomplish. You can make adjustments to accommodate volume, multiple rests, and even to finish your mash with a mash-out. Think of the mash-out as a partial batch sparge with hotter than normal water. This is especially suited for those who mash in an ice chest which should have plenty of room for that extra volume of water.

Just some basic understanding and a little imagination will help you adjust your procedures and allow you to exercise better control over your mash. It's all about managing the enzymes. When they're happy, they work better which makes us happy too; we get more from that crushed malt with only a few simple adjustments to our regimen. We can also wind up brewing better beer!