All-Grain Mashing 101 – Basics, Tips, and Tricks

Your All-Grain setup

- For electric, many All-in-One systems exist such as the Foundry, BrewZilla, and Grainfather
  - Essentially a BIAB(Brew-In-A-Bag) system
- Cheap Mash Tuns can be made with coolers and toilet hookup lines. (my main setup)
  - For 5 gallon batches: 12-15gal Cooler, SS braid from 12-16" toilet line, 7/16" Vinyl hoses, Ball Valve, rubber mini keg bung. Video at: homebrewersassociation.org/how-to-brew/building-a-mash-tun-has-never-been-so-easy/
  - Can also use a Brew Bag and only replace bottom cooler valve for ease of assembly.
- Whatever mash tun you use, know how much it can hold. Depending on size and recipe, you may need to get creative with how you extract.

Enzymes in Mashing

- Main enzymes of concern for saccharification are α-amylase and β-amylase. (diastatic power)
  - Alpha Optimal Temperature Range => 150-158F
  - Beta Optimal Temperature Range => 131-150F
    - Sweet spot is 148-152F
- Modern malts are very "hot" and convert very quickly. Mash times can be as short as 20-30min. Typical mashing time for most recipes is around 60min as that is when activity really drops off
  - Can use Iodine to check for starch breakdown. Not perfect, but a good proxy indicator.
- If utilizing non-malted or grains other than barley, keep mash times closer to 60min or higher as ratios increase.

Crushing the Grain

- Crush as finely as you're comfortable, but don't shred. You want the husk mostly intact to filter the grain pieces out of the brew liquor and keep the solids behind.
- Keep in mind some grains (wheat and rye) do not have a husk. Use **Rice Hulls** if needed to avoid a stuck sparge.
- Unless you know it, assume the gap in the mill is wider than it should be (run the malt through the mill more than once)

Liquid and Malt Ratios

- Ratios normally assume a sparge step and are listed in quart of water per pound of grain.
  - Typical range is 1.5-2 qt/lb.
  - Enzymes are in the liquid, starches in the solid
  - Adjusting the mash liquid volume will require sparge volume adjustment
- Be sure that all the grain is well mixed and wetted. Doughballs result in lost extract/efficiency.
- When calculating water volumes, account for absorption into grain that you cannot recover.
  - Assume loss of 0.5 qt/lb of grain
- No Sparge recipes use all the water upfront to account for pre-boil volume.

Performing the Mash

- **Strike Temperature** – The temperature needed for water that, once mixed with grain in your mash tun, equilibrates to the desired Mash temperature.
    - Normally about 10-15F above target mash temperature.
    - Will need to experiment with your system and setting to dial it in.
- **Simple Infusion** – Mashing using one temperature setpoint and maintaining that temperature.
    - Easiest to do with minimal equipment. A set it and forget it approach. Target the "sweet spot" temperature range listed above.
- **Step/Multi-Rest Mashes** – Mashing at different temperature setpoints to target the "ideal" range for individual enzymes.
    - Requires special equipment, specific planning, or technical expertise to hit different temperature targets. Can be automated in an electric All-In-One system.
    - A suggested starting point for step mashes is: 122F, 140F, 155F, ending at 168F to aid in lautering. All steps at 30min not accounting for ramp time.
- **Mashout** – A final temperature increase at the end of the mash, intended to keep the mash "liquefied" to make lautering easier.
    - Not strictly needed, but will increase efficiency and foam stability. Sparging hot will mimic the effect.
    - Does *not* fully denature enzymes or "Lock In" body.

Collecting Wort

- **Vorlauf** – Act of recirculating the wort prior to lauter to set the grain bed and filter chunks
    - Recommend vorlaufing for last 15-20 minutes of mash
    - For gravity systems, recommend using a temperature resistant pitcher
- No Sparge vs. Sparge (Batch and Fly)
    - **No Sparge**
        - No extra equipment and faster. Associated with richer malt flavor and higher body.
        - Least efficient, will need to compensate with additional grain.
        - Mash Tun needs to accommodate the full amount of grain and water.
    - **Batch Sparge** is where you lauter the wort from the mash and add all your sparge water at once to rinse the remaining sugars out.
        - Easy with limited equipment, but will need to mix the grain and re-vorlauf.
    - **Fly/Continuous Sparge** is a sparge technique while lautering to rinse sugars from the top down.
        - Usually requires more equipment and technique, but has higher efficiency.
- Sparge volume should be the remainder of the hot water to meet your pre-boil volume.
- Sparge water should be around 168-170F to aid in extracting the remaining sugars without getting other off-flavors. Higher temps will extract tannins and silicates from the grain.
- Stuck sparges occur with low filter material and/or running the wort off too fast. You can backflush or mix in rice hulls to get it "unstuck".

Tips:

- ***Don't overthink it!*** Malted barley wants to become beer. Once you get the basics down, most decisions are about preference and targeting the specific style you want.
- Don't be afraid of partial or mini-mash options. It is very common for big beers to supplement with extract.
- The most common mash schedule is Infusion at 152F with 1.7 qt/lb for 60min. ~80-90% of beers can be produced with this.
- Whatever system you use, make sure you know what position the drain valve is in ***before*** the hot water is added.
- **Always** have rice hulls on hand just in case of a stuck lauter or sparge. It is cheap insurance.
- Calibrate your thermometers! The only person who's absolutely sure of their temperature is the person with only one thermometer.
- Temperature ranges exist for a reason, don't sweat being off by 2-6F. Enzymes still work when outside their "ideal" range, just not as quickly. Same with mash pH.
- Mash pH does affect extraction and flavor, but you really don't need to react unless your water has high alkalinity, are brewing a very pale/delicate beer, or for recipes with high amounts of adjuncts or roasted grains.
- Mineral / Salt additions are not required for the mash. Malt already has what it needs to convert.
- Mix up the mash every 15-20 minutes. Enzymes need exposure to the starches to break them down.
- Keep your boil-off rate in mind if you over or undershoot your pre-boil volume. 99% of IBU extraction from hops is achieved in 60min. You can always add or adjust your hops to maintain balance while getting your final fermenter volume.
- Topline Efficiency doesn't mean much unless you are *very* confident with your inputs. **Consistency and understanding your personal system are much more important for predictability.**
- **There is no "ideal" way of mashing**. Do the mash that makes sense for your equipment and the beer you want.

Broad General Mash Guidance

- Cooler / Longer / Thinner
  - More Fermentable, Lower Body, Higher Alcohol
- Hotter / Shorter / Thicker
  - Less Fermentable, Higher Body, Lower Alcohol