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Mashing and Sparging

Crash Course in Mashing

The information below is for a single-step infusion mash. This is the simplest mash schedule and is used extensively in ale brewing.

Principles and Advice

In an infusion mash, water is heated to a given temperature, called the *strike temperature*. This warm strike water is mixed with crushed grain, called *grist*, and the temperature stabilizes at a lower temperature which we call the *mash temperature*.

At a mash temperature range of 150° to 158°F, enzymes in the malt activate and convert complex starches to simple sugar molecules that are fermentable. When the mash is held at a steady temperature in this range for sixty minutes, you have completed the *saccharification rest*.

You will find it difficult to precisely measure the mash temperature; in fact you must estimate it. A mash contains hot spots, cold spots and temperature gradients making a precise reading impossible. Stir the mash well and take several temperature readings to estimate the average temperature. Obtaining a responsive, accurate and unbreakable thermometer is recommended.

For your first mash, do not expect to hit the mash temperatures exactly. Don't panic—your actual mash temperature can differ from target temperatures by up to 5° F, and you will still get good results.

The main caveat is to avoid temperatures greater than 168° F until you are ready to *mash-out*, or finish the mashing process. Temperatures in this range will destroy the malt enzymes. If you measure temperatures greater than 168°F in your mash, quickly cool the mash by adding cold water. You may wish to prepare a jug of refrigerated water for just such a purpose.

If you undershoot the target mash temperature by more than 5° F, you may raise the mash temperature by adding heat. If you are mashing in a kettle, you can add heat to the kettle with your kitchen stove. Stir the mash constantly while you are applying heat. If you are mashing in a picnic cooler, add infusions of hot water.

In order to increase the accuracy at which you hit mash temperatures, *it is absolutely essential that you take good notes*. At a minimum, you should log the time and temperature before and after every significant heat input.

With this system, the combined mash/lauder tun gives you the option to use the lauder tun as a mash vessel – this will eliminate the need to transfer the mash before sparging, reducing heat loss and saving you some cleanup. Some brewers prefer to conduct the mash in a kettle, which allows the mash to be heated directly – if you use

this method, check the temperature very carefully and stir the mash often to prevent scorching.

Procedure

- Collect the strike water - you will need 1.3 quarts of water for every pound of grain to be mashed. In a kettle, heat the strike water to 175° F. Pour the heated water into the mash tun. Slowly add the grist (crushed grain) to the water in the mash tun, stirring well to prevent clumping. The temperature should stabilize at 154° F. Hot or cold water can be added to correct the temperature, but don't worry if the temperature is slightly off. The full saccharification range is between 149° and 159° F. *Do not exceed 168° F during this step*, or you may destroy the enzymes needed for starch conversion. **Note** – if you are following an all-grain recipe, use the mash temperature specified in the recipe, and adjust the strike water temperature accordingly.
- Rest at this temperature for 60 minutes. During the *saccharification rest*, malt enzymes convert the grain's starch into fermentable sugars.
- While the mash is resting, collect sparge water - you will need 1/2 gallon of sparge water per pound of dry grist in the recipe. Heat the sparge water to 175° F. The process of sparging is explained below.
- When the saccharification rest is finished, *mash-out* by raising the temperature to 168-170° F. Add very hot (200° F) water to the mash, stirring constantly. Do not allow the mash temperature to exceed 170° F as hot temperatures can leach harsh-tasting tannins from the grain. Rest at this temperature for 5-15 minutes. The main benefit of mashing-out is to raise the temperature of the mash in preparation for sparging, or the rinsing of sugars out of the mash. If the temperature of the mash gets too cold, the sugars will gum up making it exceedingly difficult for water to flow through the grain bed. Mashing-out also destroys the enzymes in the mash, preventing any additional starch conversion.
- Once the sparge water has reached 170° F, transfer it to the sparge water tank and continue with the procedure for sparging given below.

Crash course in sparging

Principles and advice

After the mash and before the boil, the newly created wort must be separated from the mash. This process is known as *sparging* or *lautering*. The objectives of sparging are to collect as much sugar from the mash as possible while leaving behind as many undesirable compounds as possible, and to make the wort as clear as possible by trapping dust and husk particles called *druff* in the grain bed itself.

Sparging is conducted in a specialized container called a *lauter tun*. A lauter tun is essentially a strainer. The false bottom in this system allows for easy, efficient separation of wort from the spent grain. Wort collects in the foundation space beneath the false bottom and exits through the valve, where it collects in the boiling kettle.

Procedure

- Recirculate! The initial runoff from the lauter tun is cloudy and filled with *druff* – small solid grain particles. Before collecting the wort in the boiling kettle, the runoff should be clarified by *recirculating* the runoff through the grain in the lauter tun. To recirculate, open the valve on the lauter tun slightly and collect the runoff in an intermediate vessel(s) – two 1 quart measuring cups or pitchers work well. When one is full, switch the hose to the other, and gently pour the wort back on top of the grain in the lauter tun. Make sure you keep the grain bed covered with liquid; do not allow it to go dry! You may adjust the flow rate out of the lauter tun if the lauter tun is draining too fast, but once you open the valve on the lauter tun you should not interrupt the flow of wort. The grain bed in the lauter tun acts as a very effective filter for the recirculated wort. Usually, after 5-15 minutes of recirculation, clarity improves dramatically. Once the runoff is clear, the

wort can be drained into the boiling kettle.

- Once recirculation stops, sparging begins. Open the valve on the sparge water tank to gently disperse the hot sparge water over the top of the grain bed. When sparging, you should balance the inputs and outputs of the lauter tun so that the grain bed is always covered with liquid. As in recirculating, do not allow the grain bed to go dry until sparging is complete. The sparge water should be about 170° F when it enters the lauter tun. This helps to maintain the temperature in the lauter tun, which aids in efficient sugar extraction. Avoid sparge water temperatures in excess of 175° F, as this promotes the extraction of tannins from the grain and leads to a harsh, astringent flavor in the finished beer. Stop sparging once you have collected an adequate amount of wort, or when the runoff reaches a specific gravity of 1.008-1.012.
- When the sparge is finished and the wort collected, move the kettle to a burner (it's very heavy and hot - be careful!) and proceed with the boil. Clean the mash/lauter tun and thoroughly rinse it with hot water; store components dry to keep them ready for the next brewing day!

A note on stuck mashes

A *stuck mash* occurs when the runnings from the lauter tun slow to a trickle and stop because the filter bed of husks has clogged. This may be caused by crushing the grain too fine, putting too much sparge water on the grain bed, losing too much heat in the lauter tun, and/or using glutinous adjuncts like wheat, oats or unmalted barley. Running wort off too quickly can compact the grain bed and exacerbate the problem.

To remedy a stuck mash, close the valve and stop adding sparge water. Gently stir the bed up into suspension (adding a bit of sparge water may help a thick bed). Slowly begin to draw wort off, repeating the recirculation step before recollecting wort. In extreme instances you may have to remove the mash, clean the lauter tun, put the mash back in the lauter tun, reheat the mash to 168° F, and start over.