

## Infusion mash temperature corrections

Written by Mark Emiley  
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When many of us go to all-grain, we typically mash in a cooler or plastic bucket because it is dirt cheap and still allows perfectly good efficiency. One drawback of these systems is the inability to adjust their temperature because putting these systems on a burner has been known to impart some pretty nasty flavors to beers.... :)

I have two methods of temperature correction. First there is quickly doing some math and adding some near boiling hot water. Before I get into the calculation, I will caveat that with: yes, you want to mix it in as quickly and efficiently as possible in order to prevent local temperature spikes and the corresponding enzyme denaturation. Now, some people may also be worried about extracting harsh tannins from the grains. This really is not a problem if your mash is at a normal pH. The tannin extraction phenomenon happens when you have high temperature AND high pHs. The catch with adding a bunch of extra water is that you end up with a thin mash which can complicate conversions. But, if you need to fix a big problem, this can work. So solving for the volume added gives, here's the equation I use for figuring out how much boiling water I would want to add:

$$V_{\text{added}} = ((T_{\text{initial}} - T_{\text{desired}})/(T_{\text{desired}} - T_{\text{added}})) * V_{\text{initial}}$$

Plug in the temperature of the water you want to add (usually close to boiling) and you are set to go.

Alternately, you can use your runnings to heat your water. To do this, you need to 2-3 quart pots (from my experience). Start out by adding some extra head water to your mash (roughly two pots full, might as well be hot water). Start running wort off just like your normal vorlaufing goes into one of the pots. As that pot fills up to maybe  $\frac{1}{2}$  to  $\frac{3}{4}$  full, switch it with the other pot, and put the first pot on a stove. Once the wort gets up to around 170-180F, gently pour it over the top of the grain bed and switch pots, repeating the process. If you don't have an extra thermometer around, you can tell when you've reached that temperature when the wort on the stove starts to get white foam on the top. That's your sign to switch pots. You basically just need to regulate the flow rates carefully as to not overflow. If you are really worried about enzyme denaturation, maybe only go up to 160F; however, remember this: most of the enzymes are in the grains, not the fluid, so you aren't doing as much enzyme damage as the numbers may seem. You are essentially doing a very thin decoction which is a time tested process. Using this technique you can have a little more control over your mash temperature (as well as thickness).

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