Home Brewers of the Palouse - Mashing

[MUSIC PLAYING]

CASSIE: Hi everyone. I'm Cassie and this is Kenzie. We are with WCU Global Campus Connections. Welcome to home brewing with Dr. John Wolff, Keith Tyler, and Darren Bystrom, all members of the Home Brewers of the Palouse.

Thank you all for joining us this evening. And we are very excited to have you all here. Please feel free to type your questions in the chat box throughout the presentation as we're looking forward to hearing from all of you.

Now let me introduce you to our presenters. We have John Wolff. He is currently a professor and a geologist in the School of Environment who was been brewing ever since graduate school. Also with us today are Darren Bystrom, who works as a system administrator for the Office of Research and has been brewing for eight years. Keith Tyler, who is a 2008 WSU graduate, a CPA by trade, and a Paradise Creek Brewery's financial manager and professional brewer.

KENZIE: The Home Brewers of the Palouse are a loose knit group of home brewers located in the Palouse area of Washington state, including, but not limited to, Pullman, Moscow, and Colfax. Before we get started, don't forget to check out their website, brewwithhops.webs.com, and look up Home Brewers of the Palouse on Facebook. Last but not least, find more Global Connections events at open.wsu.edu.

Let's take a look at their processes. And we'll be right back with the gentlemen of the Home Brewers of the Palouse.

[BEGIN PLAYBACK]

JOHN WOLFF: This is the first step here. We're drawing up water for brewing the beer through a filter here. That's mainly to get rid of chlorine. And we're using a measured amount of water here. This is going to be important so that we hit exactly the right temperature when we mix the grains into the water for mashing, as you'll see.

We have the malt here that's been crushed. It'll be ready to mix with the water when the water's hot enough. The malt has to steep in the water in a process called mashing at a fairly precise temperature. We're going to be about 152 degrees Fahrenheit for about an hour. That converts the starch in the grains to sugars. And the sugar is the raw material that yeast work on to make alcohol.

The mash has now been prepared. We're going to let that mash for one hour. And over the next hour, the starch in the malt will be converted to sugars, which is what we want for the next stage of the process.

So what Keith is doing now is recirculating the wort. This is the sugary solution that we've been producing through enzyme activity in the mash. He's draining some off, pouring it back into the top just to help clear it up and filter it, get the bits out.

So now Keith is loutering-- that refers to straining the liquid off of the grains for the process called sparging, which is flushing the grains out and rinsing the grains out to make sure we get all of the sugars out.

KEITH TYLER: It's hot right.

[LAUGHTER]

JOHN WOLFF: There we go.

We're now making the last hop addition. We've just killed the heat under the kettle. So these hops will not boil in the wort. The point here is to extract the aroma qualities from the hops to give the beer a hoppy smell after fermentation, which is generally considered a desirable characteristic.

OK, we're now casting the wort into the fermenter through a heat exchanger here. The wort is going to come out into fermentation vessel between 60 and 70 degrees to chill the wort. It will then go into the fermentation vessel, and yeast will be added.

The yeast can only operates between 60 and 70 degrees. So it's important to chill the wort. It's important to chill the wort quickly, which is the point of the heat exchanger, because otherwise other bacteria, other microorganisms will get in there and spoil the beer.

We don't want. We don't want to give them a chance. So we chill it quickly and then add the yeast.

[END PLAYBACK]

JOHN WOLFF: OK, welcome to the second of our three webinars on the craft and science of home brewing.

My name's John Wolff. To my right is Darren Bystrom, to my left, Keith Tyler. Tonight we want to focus on mashing, which is really the heart of the brewing process. But first I'd like to invite folks, if there's anything you specifically want to hear about during the next hour, then please let us know via the chat box, and we'll do our best to answer your questions later on in tonight's program.

So if we could go to slide number three on the PowerPoint. This is a flow chart that's an overview of the brewing process. We start out with barley or occasionally some other grain, but typically barley, which is used for 99% of the world's beer.

And that barley is processed through malting and mashing to create the sweep wort as we call it, which is basically the unfermented beer. So we're going to walk you through that process now. And then in a few minutes, we'll have an actual demo of the mashing process. Slide number four.

Barley grains store energy in the form of starch as many plants do. This is to keep the grain alive with a food source, a stable food source through the winter before spring germination. Or that's what would happen in the natural world.

The grain stores energy form of starch because starch is really, really stable. But by the same token, it can't actually use the starch in its naked form. So the grain also has enzymes that break the starch down into sugars that are usable by the plant when it begins growing.

So barley grains not only contain energy in the form of starch. And for the scientifically minded among you, there's a picture of, or a representation of the starch molecule on the left hand panel of the slide. And in addition to the starch, it has enzymes that break the starch down. Slide five please.

The first stage in that process is malting. This is carried out in heated rooms on anything from a craft size like a small room or bar up to an industrial scale in the case if the big brewers. What malting does, it causes the grain to begin to grow. So the grain is kept under conditions of controlled humidity and temperature. That causes it to germinate and grow.

As you can see in the top left panel of this slide, the magnified picture of the single barley grain-- the brown and green thing in the picture there-- the green part is the shoot of the grain which actually grows up inside the kernel itself and almost breaks out at the tip. That's the growth stage of malting.

In the process, starch molecules, big starch molecules, stable starch molecules are broken down into smaller ones. And a little bit of sugar is created as well. At the same time, the grain spouts a root. And you can see pictures of rooted grains in the Petri dish on the lower left corner of the slide.

Those roots are easily broken off. And in fact, we don't want them in the brewing process. So that's broken off as the malt is handled. If you just look at a kernel of malt, it's pretty much indistinguishable from the regular barley grain, maybe a little bit fatter. Slide six please.

Mashing is what the brewer does. And what we're going to demonstrate here at the moment-- that noise by the way is some water heating up for the mash demonstration. During mashing, it's kind of a continuation of malting. The grain is first crushed. Keith will talk about crushing grain in just a moment here.

And then it's mixed with water typically at about 150 degrees Fahrenheit And at that temperature, more enzymes are activated in the malt grain to complete the process of breaking the starch down in sugar. And the starch is completely broken down into a collection of sugars to make the wort. And wort tastes really sweet. It's basically a sugar solution. And that's the raw materials for the beer-- for years to act on during fermentation to produce the beer.

But that's jumping ahead quite a bit. The picture on the slide is a brewer performing the operation that we call mashing in. That's mixing the grain and hot water together to begin the mash process.

A little bit later on tonight I'll talk about the mineral content of the water that's necessary for successful mashing and brewing. But I think right now, I'll hand over to Keith who's going to talk about crushing the malt and the importance of getting a good crush.

KEITH TYLER: OK. So I have a couple examples of grain here. Like John said, when you get malt, typically it's going to be in a whole kernel. In order for the mash to be able to access the starches and convert them to soluble sugars, you have to actually crush the grain to a point-- and if you want to get it close up on this-- that the kernels are broken into about two to three different pieces per kernel. And you want to have a lot of whole husks intact to help with filtering.

We've got two examples. This is the example we're going to be using today. And this is a pretty good crush. You can see there's a lot of whole-- no whole kernels, but a lot of whole or intact husks, small and medium sized pieces of grain, and very little flour.

You can see in this sample, this is a much finer crush which you don't necessarily want or it's a lot more risky to mash with this type of crush because all the flours that's in this will tend to gum up and create a kind of a doughy mess that's very difficult to sparge through and separate the sweet wort from the grain itself.

So many of you, if you're just starting out with brewing may not have to worry about the crush specifically. If you go to a home brew shop and order your grain, you can usually get it crushed there at the shop. Typically they'll tend to have a bit of a courser crush, which may hurt your efficiency slightly. But it'll be consistent, and you shouldn't have any problems with sparging.

So on that note, I think if we're ready to mash in, let's do it.

DARREN BYSTROM: I think we're ready. So as John mentioned, you trying to aim for a typical mash temperature for the enzymes to do their work of around 148, 158 degrees, somewhere in that range. 150 is a good fermentable wort.

If you notice right here on our thermometer, we have what's called a strike temperature. So this is the temperature of the water that we're going to be adding grains to. It tends to need to be higher than the actual mash temperature as the volume of the grains, as well as the mash tun itself-- in this case we're using an insulated cooler-- will lower the temperature of the mash during the process.

So go ahead and we'll demonstrate. At this time, we have-- oh what does it say-- we'll call it 176 degrees. It might be a touch warm given our example here. We'll go ahead and add this to our mash tun. And actually in this particular case, we're using a braided vessel at the bottom. I'll go through the various options here in a moment of mash tun design. We're going to add our water to that.

KEITH TYLER: Is your valve closed?

DARREN BYSTROM: It is. As Keith mentioned, a good thing to check if you happen to have a ball valve on the front, you'll end up a little wet if it's not closed. And from there, you just mix in your grain.

At this point, you could wait a few minutes, take the temperature to ensure that the t water has cooled down a touch. Since this is a brief demo, we'll just go right on ahead.

You want to rather than pouring all in once, pour somewhat slow and stir while you pour. This will prevent what's called dough balls. If you have a dough ball in the mash tun, basically water will not be in touch with the grain, and so you'll lose efficiency and basically, the availability of converting those starches to sugars within the wort itself.

Get rid of that. Get in on there.

We have somewhat of a thin mash right now. But it looks pretty well mixed. In a few minutes, we'll take the temperature and check the pH. But in the meantime, I'll let John go ahead and start talking about salt additions that one could add to the wort. Or maybe, do we feel like taking questions at this time?

JOHN WOLFF: Yeah, do we have any questions right now?

KENZIE: Right now we do have one. We have someone that is asking if you can mash for too long and what would happen at that process.

JOHN WOLFF: That's actually a really good question. Most mashes last about an hour or so. The starches convert into sugar with modern high quality malts, typically in about 15 or 20 minutes. We mash for a little bit longer than that to get good flavor development.

If you mash for too long, there's a risk of extracting tannins and other undesirable substances from the malt grain. However, I know many home brewers who for reasons of time-- they don't have enough of a block of time to follow a brew through from start to finish on one day. So they actually mash overnight in an insulated container like this.

And the beer seems to come out fine. So I guess that's not really answering the question, but it's-- some folks have maintained that yeah, mashing too long does inhibit the quality of the beer. Other folks seem not to have a problem.

KEITH TYLER: One thing with an overnight mash like you mentioned to pay attention to is that a long mash like that can produce a much more fermentable wort. So basically you're going to have a long time at a lower temperature that allows the beta amylase to work at the starches and produce much more of fermentable sugars as opposed to the dextrans that most yeasts won't convert into alcohol.

So that can lead to a very dry, higher alcohol beer then you're shooting for. If that's what you're going for, great, just something to keep in mind.

JOHN WOLFF: And of course, if you are going to overnight mash, you've got to have a way of maintaining the temperature throughout the night. If you don't get the temperature right, the beer will be way off your design parameters.

DARREN BYSTROM: Initially if you get it right, you're fine. A next day depart might not change it so much.

KENZIE: And we do have someone who's asking if you can talk a bit about the different types of yeast, like powder versus liquid and those kinds of things.

JOHN WOLFF: We're going to be focusing on yeast in next week's session. But I can answer the question pretty quickly. Most of my view is that liquid yeast is far superior in quality to dry yeast. It's harder to keep. It has a shorter shelf life. But having said that, there are some pretty good dried years on the market now. You guys might have another opinion.

DARREN BYSTROM: I would say one of the key uses of using a dry yeast, a lot of microbiologists from the prominent home brew yeast providers, White Labs and Wyeast have stated that it's very good to rehydrate the yeast. There tends to be instructions on the packets. If not, it's readily available on the internet.

If you pitch the dry yeast directly into wort, you can end up with a lot of cell death just due to the wort, basically the sugars in the wort just absorbing into the cells themselves and overwhelming the cells. So there are instructions. I would highly recommend rehydrating the yeast prior to pitching it into your wort.

JOHN WOLFF: Just stir it into 90 degree water, right?

DARREN BYSTROM: Maybe a little bit less than 90 just for the sake that you don't want to shock the yeast too much.

KEITH TYLER: Just boil and then cool the water to room temperature and you'll be safe. One other thing of note with the difference between dried and liquid yeast is that the cell counts of dried yeast packets tend to be much higher than the liquid yeast vials or the Wyeast Smack-packs.

Generally, you can pitch a rehydrated packet of dry yeast into most beers that you make in a five gallon batch and you'll be just fine. If you do that with a vial of White Labs or a Smack-pack with just a single pack, unless it's a low gravity beer, there's a good chance you'll be under pitching. So you may want to go ahead and use two Smack-packs or make a starter with a single pack.

JOHN WOLFF: Some home brewers get into actually culturing their own yeast, but we don't really have time to go into that right now.

OK, we can talk a little bit about water chemistry. You can't just use any water supply to make any beer. Maybe the most famous example is pilsner beer. True pilsner beer from Germany is made with very, very pure water. In fact chemically, it's almost distilled water. It has a very, very low salt content.

Most beers, and certainly most ales, it's desirable for the water to have some calcium content, dissolved calcium. But there's a problem with most natural waters, regardless of where your water comes from-- whether it's a reservoir supply or ground water-- which is that most natural water contains plenty of calcium, but it's in the form of calcium carbonate, which you don't want because that makes the water in the mash too alkaline for the mash to proceed properly.

The enzymes that are present in the malt are pretty picky when it comes to the acidity range that they'll work in. Acidity is measured on a scale called pH. Which is is a scale that goes from 0 to 14. The enzymes in malt only work at their optimum between about 5 and 5.6. So that's what, 1/30 of the whole scale. So they're pretty choosy, pretty picky.

DARREN BYSTROM: Do we want to jump in and test that really quick?

JOHN WOLFF: Sure, yeah.

DARREN BYSTROM: So as John mentioned, we're testing the pH. And we'll see where we're at. This is some malt for a brown ale. And given our water here in Pullman, we shouldn't have too many issues with the pH. But let's go ahead and double check.

As a temperature update as well. We're a little warm. We're just above about 160. So we may not get good conversion due to overshooting the temperature.

These are pH strips that you can get from most home brew stores. They have a range of 4.0 to 7.0. As John mentioned, the range that you're looking for is in the 5.0 to 5.5 range.

At wort temperature, the pH tends to be somewhat lower, about 0.3. If you lowered the wort temperature to room temperature, you'll end up with a higher range.

In this particular instance, it looks like our mash pH is not in range. We're a little high on the scale. I would say, oh, closer to 5.7, 5.8 or so.

So it's not quite ideal. We may have some conversion problems and issues down the line. But certainly there will be conversion taking place at this--

JOHN WOLFF: I would ordinarily add some salts for this. So the way we get around the calcium problem is by adding calcium in another form, not calcium carbonate. And there's usually two ways to do that that is practiced by most brewers.

One is to add gypsum. Which again, for the scientifically minded is calcium sulfate hydrate, hydrated calcium sulfate.

DARREN BYSTROM: John, go ahead and add some of that in there.

JOHN WOLFF: Sorry?

DARREN BYSTROM: Let's get our pH in check.

JOHN WOLFF: Go ahead. And the other form is calcium chloride. Calcium chloride is the same stuff that is available as de-icing granules that you throw in your driveway to melt ice in the winter.

It tastes-- I don't recommend that you actually taste a spoonful of it-- but it's a bit salty and very slightly sweet. And so calcium chloride is usually used for beers that don't have much hop character.

For very bitter beers such as pale ales, IPAs, you want to use gypsum because gypsum itself has a bitter character. It adds a minerally bitter flavor to the beer. So that's the reason why we've got a couple options here.

It sometimes happens if you have a very pure water supply and you're brewing a dark beer such as a stout, that your pH will actually be too low. And in that case, yeah, you do actually want to add calcium carbonate to the water. That's a fairly unusual circumstance. Most natural waters have already had plenty of calcium carbonite.

Now the makeup of our water here in Pullman is that it does have quite a bit of dissolved calcium carbonate. This gives the water a measure of hardness and alkalinity. And in fact, the water is ideal for brewing stouts. When I brew a stout, I don't make any salt addition or adjustments at all. But for anything paler than that, any non-black beer, we do want to add either gypsum or calcium chloride. And for a pale beer such as a pale ale or an IPA, you can add quite a lot of gypsum, up to three teaspoons for a typical five gallon batch.

How are we doing here now?

DARREN BYSTROM: Let me double check. Temperature still actually looks like we dropped a bit, just due to our low volume. So it's probably stabilizing a little bit better. We're right at 154 which will be actually pretty nice for this style of beer.

We'll check pH one more time. And as John mentioned on the water supply as well, I would say argue against adjusting water supply until you know your base water that you're working with. Your municipal water utility will be able to give you the numbers that you would use for brewing, and you could bake your adjustments off based on that.

KEITH TYLER: As a side note, John Palmer has a very good water additions calculator. Just a simple spreadsheet you can download on his website along with the rest of the content of his How to Brew book. Definitely recommend checking that out if you're interested in making some changes.

DARREN BYSTROM: So before we adding the gypsum, I mentioned that our pH was around 5.7, 5.8. Since adding the gypsum, we've dropped to around 5.4, 5.5, which is going to be a little bit more ideal for the conversion of the beer.

JOHN WOLFF: By the way, we're experiencing a great smell here. I'm sad you can't share it.

DARREN BYSTROM: Some folks I guess do not like the smell. I haven't encountered a single individual who dislikes it. You might read on the forums that significant others may not appreciate one brewing in the kitchen, but that's up to your to sort out.

I guess from there, we mentioned the mashing earlier. There's some various steps you can do equipment wise for sorting out the mash. In this particular instance, we used basically a braid in a round cooler. It's very similar to this larger vessel that one might use for full batches. So here's a braid that one might use in their.

Additionally, for these round coolers, which is an added bonus, you can buy a screen that fits snugly in the bottom. And that will help filter out some of the grain when you're extracting the wort later in the process.

Another option for those that may have a rectangular cooler is you can build a manifold in the bottom of your kettle. And that will also help do much a similar instance to the round screen there on the bottom.

As Keith mentioned a moment ago, John Palmer's How to Brew is a great resource. And in one of the appendices, he mentions the various manifold designs that one may use for the proper flow rate within the cooler itself.

JOHN WOLFF: Keith, do you want to talk a bit more about the importance of mash temperature?

KEITH TYLER: Oh sure. So like Darren said, 154 is a good temperature for a brown ale. That's typically a middle of the range temperature that'll give you a good balance of fermentable sugars and dextrans to contribute to the body of the beer.

The normal range for most mash temperatures is between about 148 to 160 at the high end. The difference between those is that on the lower end from 148 to 152 or so, you'll have a more fermentable wort. And from 152 on up to 160 you can have a highly dextranous wort that maybe isn't quite as fermentable, but it'll give you a really sweet, full bodied beer.

Now you can use that for different purposes. If you have just a light, light beer like a Kolsch or Blonde or something that you don't want a ton of body in, but you just want it to ferment out clean and dry, then tend towards the lower end. If you're doing higher gravity beers or sours, somewhere where you want a lot of unfermentable sugars and starches for bugs or other non-saccharomyces yeast to work on, then tend towards the higher end of the range.

But I guess what the difference is between the lower end and the higher end of the range, in the starch or in the malt kernel, there are two separate enzymes that go to work at converting the starch into sugar. There's alpha amylase which is the one that works at the higher end of the range, and beta amylase which works at the lower end of the range. So the 153, 154 range is a good temperature where both of the enzymes are working. If you go higher than that, it tends to-- well it does denature the beta amylase. So it's no longer working.

If you go lower than that, then the alpha amylase isn't working. Or it isn't working quite as much as it is it should be. So that's a basic primer on the mash temperature.

JOHN WOLFF: How are we doing here?

DARREN BYSTROM: We're still holding a good temperature at 154. And I guess we've been mashing 20 minutes or so. One might mash for anywhere from 30 minutes to an hour. Home brewers typically mesh for about one hour. But professional brewers just int the sake of time may mash at a lower amount of time.

There's a method for testing whether or not you've reached a full conversion of the starches to sugars. And that's using just plain old iodine. Later in the process we'll draw off some wort from our mash tun here. But if you mix in iodine with a sample of the wort, if it immediately turns black, you know you have starches. If it stays a moderate brown color, then the conversion has completed. And then you have the amount of sugars. And feel free to draw off your wort into your kettle.

We have any questions in the meantime while we're waiting on this?

KENZIE: We have one. It's a little off subject. But they would like to know if they-- well first of all, he asks if it's already carbonated, what is the PSI I should be using to keep it at room temperature?

DARREN BYSTROM: So this is if one is kegging. Off the top my head, I do not recall those numbers. There are carbonation tables that one could look up online. I'm trying to think. Any off hand, anybody?

KEITH TYLER: At room temperature I'm not entirely sure. But if you--

JOHN WOLFF: It's fairly high. You want about 15, 20 PSI I think to get two or three volumes.

KEITH TYLER: If you carbonate the beer at whatever temperature you're carbonating at, if it's carbonated to the level you want it served at, then you can store the beer at room temperature. And as soon as you bring it back down into the serving temperature range, it'll redissolve the CO2. So you'll be right where you need to be.

JOHN WOLFF: So yeah, maybe a few more details about mash acidity. If we could go to slide seven on the PowerPoint.

The way that calcium actually works is that it reacts with phosphate that's naturally present in the malt. Phosphate is present in most foodstuffs or most vegetable foodstuffs.

The calcium actually binds to the phosphate and releases hydrogen ions into the wort. Hydrogen ions are actually what acid is. That's what makes acidity. So that's why we add calcium to lower the pH somewhat of a wort that would otherwise be alkaline.

Dark grains such as the chocolate malt and black malt and roast barley that are used in stouts and porters to a lesser extent have their own acidity. They're practically burned during manufacture, deliberately burned manufacture. And that produces a natural acidity in the malt. And that's why we don't need to add calcium when we're making a stout. What we have here is more of a mid-range brown ale type wort.

DARREN BYSTROM: You can go ahead and move along towards where one might go in the process after the mash. The next process is called the sparge. And that's a process of adding water to the volume in the mash tun in order to extract your pre-boil volume during the process.

Unfortunately, we don't have any other water to add for the sparge. But there's two different methods. There is continuous sparging or fly sparging. It's basically the same method in which you add a small amount of water to the top of the mash tun while equally drawing off the same amount of wort out of the end of the spigot there and draining that into your kettle.

During this process, the denser sugars will continue to settle to the bottom of the mash tun as you're adding water to the top. And you'll end up hopefully with a fine extractive wort at the very end of the process.

The other method of sparging is called batch sparging. It tends to work somewhat better with the braid that we have in here. Within batch sparging, you would add a measured volume of water that's-- well excuse me, in both instances on the sparge, you want to aim for about 170 degrees Fahrenheit. And during the batch sparge, you want to spread out your volume that you want to end up in the cattle with into two separate amounts.

So in this particular instance, we have about 2.5 quarts in this cooler. The grain will have absorbed, oh, off the top of my head, I don't remember the ratio. But it will absorb some of that amount. There are calculators online.

And then you add another volume of water. Stir that water in. And then prior to draining the kettle on both instances of sparging, you want to do what's called the vorlauf process. And that's a matter of taking some of the wort and draining it into a vessel of some sort. In this case, we'll grab a couple cups here.

And that's to basically, you're trying to make the grain itself that's in the mash tun work as a natural filter bed. So if you look at this first draw that we have here, there is a number of particulate matter, just malt that's in there. You do not want to end up with that in your kettle as you can add astringent flavors later in the process.

So during the vorlauf it's just a matter of recirculating. In this particular instance, try and pour carefully as you don't want to disrupt the grain bed. And this will occur several times until we get to what's referred to just as clear wort.

Ideally, you have no grain particulate in the wort, and you have no-- well, it's as clear as possible. Batch sparging, you might end up with a slightly cloudier beer, at least in my personal experience. Fly sparging, I've had better success getting a clearer wort. Keith, any thoughts. You tend to--

KEITH TYLER: I would agree. I've done both and the fly sparge tend to produce a clearer beer.

JOHN WOLFF: There's some interesting history behind the two sparging methods. The fly sparge, where you maintain a constant head of pressure of water over the bed as it's straining is indigenous to continental Europe, particularly Germany and the Czech Republic. And it's also practice by American brewers because the American brewing tradition is largely a German inherited tradition.

In Britain, batch sparging was the traditional method where the bed is completely drained and then, as Darren said, it's re-flooded with water. And that more dilute liquid is then drawn off.

And the history behind that is that back in the old days, they tried and squeeze two beers out of one mash. There'd be a strong ale, which should be the first wort drained. And then when the bed is re-flooded with water and the more dilute wort is created, that would be what's called small beer. That in the days before municipal sterilization of water supplies was about the only stuff that was safe to drink-- certainly in a heavily populated city. And small beer was the everyday drink of people. It wasn't particularly alcoholic, about 2%.

In Scotland, they actually sometimes squeezed three worts, three beers out of the same batch. And the final one was pretty revolting.

[LAUGHTER]

DARREN BYSTROM: Now we are having some difficulties clearing the wort, probably just due to this not being the best manifold or braid. This particular braid in here is a little bit wider than the one Keith has. That'll do a better job.

JOHN WOLFF: It looks like it's clearing up a little bit.

DARREN BYSTROM: But it is clearing. We have significantly less large grain particles. But we are getting some in there still. At this point in the process, there's no set time for the vorlauf Generally, it's as long as it takes in order to clear the wort.

For argument's sake, let's go ahead and take a starch-- let's do the iodine test and take a gravity reading with the refractometer.

It's hard to get in here. As you can see, we still have a number of grain particulate in there. So this iodine test will likely turn black.

KEITH TYLER: That's one important thing with the iodine test is to make sure you have clear wort that you're testing. If the iodine has any access to the grain itself, obviously there's going to be some starch left in that that it will react with.

DARREN BYSTROM: Let's go ahead and get a nice zoomed in shot here. And hopefully see the color transition when we're adding the iodine into the sample.

If you notice, there's a significant portion. It looks like it's pooling as black at the bottom. Due to the grain in suspension, well, that's going to cost some of the test and may or may not have reached our complete conversion of starches to sugars.

One thing to note-- you do not want to add this sample back into your wort as iodine is not going to be very flavorful for your beer. Even small parts per million are going to be noticeable in the end product,

So we'll go ahead and for the refractometer, we also want to take as clear a sample as possible. So we'll keep some of that grain particulate out.

And the refractometer is a similar piece of equipment to the hydrometer, which is this right here. Both measure the density of sugar within a liquid solution. This measures in what's called specific gravity, while this is a measure of degrees Plato or Brix. Basically a degree Plato or Brix is equivalent to around a quarter of the specific gravity. So if you have say, 10 points on your refractometer, that's going to be equivalent to about 40 points specific gravity. So we'll take a reading here.

And our refractometer basically works by passing light through the sample on top of a glass prism. And you look up into the eyepiece. In this particular case, our first running are just about 10 points.

So actually we'll go ahead and we'll take a sample here and show you that difference within-- or excuse me, one of things to mention between a hydrometer and a refractometer. Hydrometers need to be measured at-- they're calibrated for 60 degrees Fahrenheit. If you have a higher temperature sample, which in this particular case we do at around 140 degrees or so at this time, you're not going to get an accurate reading with the hydrometer.

And that's where the refractometer comes in. As the sample is so small, it will I guess lower down to as close to the sampling temperature that you need and give you an accurate sample. So on that note, I'm going to avoid this for now. But provided both are calibrated, it is a quarter amount of Brix per degree specific gravity.

KEITH TYLER: One thing that you mentioned about the sparge water temperature being at 170 degrees-- the temperature is important because-- well, on twofold. 170 degrees will raise the temperature of the mash enough that it halts enzyme activity. It denatures both the alpha amylase and beta amylase. So no further conversion will continue at that point.

It also helps to solubilize the sugars into the water. So you'll end up with a better extraction efficiency with a higher temperature.

On the flip side, you don't want to go to warm with the sparge water, because if you go above maybe 172 or so, you'll start to extract tannins from the grains which will give it a stringent, bitter taste that you don't want.

JOHN WOLFF: So what Darren has there in the Pyrex jug, when the vorlauf or recirculating is finished, eventually that's what will be drained into the kettle. And it's then boiled with hops to make the final unfermented beer.

We call that sweet wort to distinguish it from bitter wort after the wort's been boiled with the hops. And that's the heart of the beer really, the sweet wort. That's the fermentable material.

Should we talk about hot scotchies?

[LAUGHTER]

If you're brewing on a cold day, I've seen this done. Some people take a little glass full, a few fluid ounces of sweet wort and mix it one to one with single malt scotch whiskey. That's call a hot scotchie. And it's--

KEITH TYLER: Surprisingly good.

JOHN WOLFF: --actually very pleasant.

DARREN BYSTROM: Any other questions on the board?

CASSIE: Yes. So instead of cracking the whole grains, how would someone go about germinating them?

DARREN BYSTROM: Oh, if you're making your own malt? So some folks have tried making their own malt. You're going to add the malt with a certain temperature of water to basically start the germination process. The germination process is the plant's ability to basically start growing as a plant.

During that time, because of growing conditions of any plant, you'll need to maintain both temperature and humidity if you want a good quality malt. Personally, I have not tried malting my own grain. It seems like an interesting concept, but with the high availability of very quality malted barley from a number of manufacturers, it's just something I haven't spent the time to do.

But basically what you're looking for-- and John mentioned in his slides-- is that during the germination process, you're trying to get a number of starches built up, basically the fuel for the plant at a certain point. And when you reach that point, you halt the process by basically killing the malt, whether it be oven roasting if you're at home or maybe a coffee kiln roaster if you happen to have one. That might be a little warm for most malting practices, but that's certainly one option.

JOHN WOLFF: Yeah. I know folks who have tried malting their own barley. And the results are usually not very good.

The only reason to do it I would think would be maybe if you're growing your own barley and you actually want the satisfaction of it being 100% your own product, rather than starting out with buying malt. Most home brewers buy their malt already malted.

KEITH TYLER: If you do do it at home-- which I also haven't done-- but if you do it at home, another thing to keep in mind is that it is going to be less modified more than likely than the quality malts you'll buy at the store. So with that comes new things to pay attention to in the mash. So you might be doing some step meshing with an acid rest, a protein rest, an increasing up into the sacrification rest, which is what we're doing right here in a single infusion.

So it complicates things. It's doable, but it makes more complicated.

KENZIE: We have one more. We've got one. They want to know if the mash tun shape matters, and if it does, what is the best one that you would recommend?

DARREN BYSTROM: Well, I think you can have success with both. The mash tun geometry, what matters is your ability to collect wort evenly across the bottom of the grain bed.

So in the sake of-- well, then that's more so for flyer, continuous sparging as opposed to batch sparging. Batch sparging, with the braid, because you're saturating the wort and the sugars in that wort and drawing it all off in one large swoop, you're basically getting all the sugars. Whereas with fly sparging, you're trying to avoid astringent flavors due to the pH rising as well as grain extract or the tannin extraction from the pH. I'm getting out of hand there.

JOHN WOLFF: Well the only really critical thing I think in mash tun design is people use these cylindrical coolers. They're rectangular coolers. I have a mash tun made out of a regular 15 gallon tank. They all work fine.

The one thing you want to avoid is having too deep a grain bed for the width of the grain bed. That just creates problems with draining the wort from the grains if the filter bed is too deep.

So you would not for example want to try and fabricate a mash tun out of a cornelius keg, which is basically a tall thin tube about that high and that big around. You don't want to do that.

The rule of thumb is that the mash bed should be no thicker than it is broad. Although, I certainly exceed that sometimes without too much problems.

DARREN BYSTROM: Certainly on that same note, as John mentioned on the size of the grain bed, if you go too thin, you're going to have a lot of problems during the vorlauf getting a clean run off of the wort. So that can pose issues as well.

Back to the fluid dynamics. You're basically trying to get an even mash bed. As mentioned before, John Palmer's How to Brew does a great job explaining the difference between say, the round cooler versus the manifold which is going to draw from, rather than an almost equal area with a perforated screen to the tubes. There's some differences, and so it's just one can account for the math. And thankfully other folks have taken the time to do that math, and I don't need to worry about spending too much time thinking about it.

JOHN WOLFF: You want to polish things off by just draining the wort now?

DARREN BYSTROM: So provided it ends up being clear-- in the sake that we'll call it, say we're doing a batch sparge which we've added the amount of a set amount of water. And we've now done the vorlauf.

On a batch sparge, you can just let it rip. And drain entirely into the kettle. Whereas as mentioned before on the fly sparging, you're trying to equal the rate that you draining.

So fly sparging can sometimes take longer depending on what you encounter flow wise. Whereas batch sparging is somewhat faster.

In this particular instance, since we did not add any sparge water to the mash tun, we have a somewhat low volume of wort. I guess this size mash tun I want to say is about two gallons. So it's probably good for making about a gallon of beer after the boil and everything else. Whereas a larger mash tun like that 10 gallon cooler or the 10 gallon square cooler, rectangular cooler could make, oh--

KEITH TYLER: Five to 10 gallons.

DARREN BYSTROM: Yeah, five to 10 gallons depending on the gravity of wort.

JOHN WOLFF: So we've got about 10.5 Plato here. So the wort that we've made here would be-- it's about right for an English brown ale session type beer. If we fermented that out now, we'd get a beer of about 4% alcohol, 4.5% maybe, something like that.

So what Darren's just drained the wort from the mini mash tun there. The next stage of the process would be simply adding hops to that pan, that kettle, and then letting it boil for an hour to extract the flavor and bitterness from the hops.

As we mentioned last time, if you saw our first webinar in the series, you can actually skip all of this by using malt extract. So you don't have to go through all this procedure. But remember, malt extract does not make as good beer as mashing does. And that's why most home brewers, if they stick with the hobby, sooner or later they make the jump from malt extract to mashing.

KEITH TYLER: Plus it's more fun.

JOHN WOLFF: It's more fun, yeah.

DARREN BYSTROM: I agree. You have a lot more control over the brewing process. If you're mashing yourself, you can say, hey, I want a little bit of a black patent in here, which is a very dark mark. Or I want a 100% pilsner malt, and anywhere in between. Can you guys say off the top of your head how many malts between the various different [INAUDIBLE]. It's well--

KEITH TYLER: 80 to 100, at least.

JOHN WOLFF: It must be getting on for 100.

DARREN BYSTROM: Between base malts, specialty malts, and other adjuncts that one could add to the beer.

[VIDEO PLAYBACK]

-Because it's fulfilling and personally rewarding. And I love beer.

It's like any other creative act. You're making your own thing. An artist probably feels the same way. It's something you've done yourself, from your own resources, your own knowledge and skill.

If the results are good, you give yourself a pat on the back. If the results are bad, you I guess just deal with your depression by drinking it away.

The most difficult is that it's-- if you're doing the brewing as we are here. What we're doing here is in micro what any commercial brewery would do. And it's a little bit time consuming. For the hobbyists, there is a shortcut that we'll explain here pretty soon that involves the use of a substance called malt extract.

What we've done up to this point in fact is just make malt extract. But yeah, it's the time involved is probably the most difficult part. But if you get a good product, it's worth it.

Oh yeah.

[LAUGHTER]

The worst beers-- for most home brewers, the worst brewing experience is when a batch gets infected with microorganisms that you don't want. And that can result in just undrinkable beer. So you pour it out. I've had that happen a few times

The best experience is when you brew a beer that you know is world class.

You know, I don't really have a favorite. I like pretty much all beer except maybe some dodgy fruit beers.

[LAUGHTER]

My favorite style of beer to drink is English bitter like we're brewing here at the moment and dark beers such as porter, stout, and Munich dunkel and bock.

-I guess I brew because it's intriguing. There's a lot going on. There's good friends to be had. And at the very end, you have something to drink and share and enjoy.

What I enjoy most about home brewing? Its a phenomenal mixture of both art and science. You have the creative side of things where you try and idealize what your beer is going to be.

And at the same time, there's the science behind it. There's a number of factors-- chemistry, biology-- that take a huge part into making a good beer. And trying to get everything together to make it excellent is a lot of work.

It can be a lot of work. For instance, stopping by here, hauling our equipment. There's a lot of manual labor involved. The bigger breweries that do it professionally, having everything in place makes it a lot simpler. And someday, putting either a home system that's in one place or shoot, brewing professionally would be a lot of fun.

Advice I would give to beginning brewers? Try and keep it simple. There's so many things you can find on the internet, so much information, so many books to read. But what it comes down to is just paying attention to the various things such as temperature. Just paying attention to temperature, both in your match if you happen to be all grain or if you start extract, just at the very end of things, fermentation temperature is going to make a world of difference in a good beer. And from there you can research and go into something much more elaborate and take it from there.

I originally got started, a roommate had a mystery beer kit some eight or nine years ago that made terrible beer. And I remember thinking, I can do better than this. And so I ended researching for a while and decided yes, it's going to be a lot of fun. And eight years later, it's still a blast. It's still enjoyable. And I can't imagine having a better hobby.

-You know, there's a lot of things I like about home brewing. As they've said, I enjoy the science of it, the art of it. There's always something new to brew. And you never get bored doing it.

I found it's something that's just-- there's always something new to learn, new processes to check out. And it's just a lot of fun all around.

My favorite part about brewing is just learning new things every time. There's a lot of literature out there. There's a lot of other experienced people. And that's actually one of the best parts about brewing is just the camaraderie of the home brewing community. There's always people out there willing to help, willing to come by and drink a beer with you and show you some new things.

The worst part about home brewing is not having the space to keep expanding your hobby. You can spend as much money, get as much equipment as you want to do whatever you want to do with the hobby. But constraints are usually space and money. And they can get expensive.

Well this is slightly embarrassing three years down the road now. But I got started with brewing because I wanted to clone a Mac & Jack's. Looking back on that now, that may not have been the best one to try and clone, and I haven't done it since. But yeah, not being able to get Mac & Jack's at home or in a bottle at the time was how I got started.

-Because it's the hobby that never ends. You can learn as much as you can about any kind of hobby, but you're never going to stop learning about home brewing.

Every person that I come in contact with about home brewing always sheds new light on the subject. It's like this ever evolving hobby that just never ends.

What I like most about home brewing is being able to step back once the product's done, once we're done brewing, and it's done carbonating and conditioning, and you get to reap the benefits of your sowing or whatever.

The hardest part is definitely sanitation. Making sure that everything is as clean as you can get it is the key to making a good beer, and it's also the hardest part, because infections are the worst part of brewing a beer.

Don't get discouraged. I made a bunch of really undrinkable beers. I've thrown out some batches when I first started. And not giving up hope, it's a learning process. And the best thing that you can do is just power through those-- I guess they would be the equivalent of a C on a test, or a D on a test. You keep working and then you'll get an A.

How did I get started? A friend of mine showed up with a kit and was like hey, we're going to brew some beer. And I said, well, I've got nothing better to do today, so let's do it. And it snowballed from there.

It's a hobby that snowballs. Once you get started, you're a brewer.

[END PLAYBACK]

KENZIE: And thank you so much for joining us tonight with Home Brewers of the Palouse where they were talking a little bit about our mashing techniques.

A couple of reminderse-- join us next week here, same time, same place, for a little bit of fermentation and boiling of the wort. They're going to talk about varieties and things again. And they also wanted me to let you know they have a hops meeting tomorrow at 6:00 PM in the basement of Paradise Creek Brewery. So please, definitely join them.

And once again, we'd like to say thank you again to John, Keith, and Darren from Home Brewers of the Palouse Think so much everybody. And have a great night.

[MUSIC PLAYING]