

Krausening Your Lagers

As I sit here pecking away on my laptop, I'm gazing into a cold mug of one of my last remaining lagers from the 2023-24 brewing season. As I sip, I'm reminded why I consider krausening an integral part of my fermentation regimen. Similar conditioning techniques exist across the spectrum of well regarded brewing cultures; the priming of English cask ales for example or the re-yeasting techniques used by the monks for their strong Belgian beers. These techniques are essentially very similar to krausening, and are done for the exact same reasons. However, when you're talking krausening, you're talking lager-making. Krausening was developed as a fundamental way to develop carbonation (aka "condition") in the finished bier, by reintroducing young healthy and actively fermenting bier after primary fermentation. There's more to it than this but we'll get to that later.

The procedure is simple. Krausen bier is flowed into a lagering tank or keg along with the post-primary bier. The vessel is sealed and the bier then begins its slow decent into the long cold lagering period. It's an age-old technique that has long been considered a staple of old Bavarian brewing practices, but it is scarcely practiced today. Commercial brewers haven't the time nor space to justify it (and perhaps their customers are none the wiser). Just as likely, their timelines and systems don't account for a krausening step. That's ok, one of the best things about being small scale brewers is that our systems can more easily adjust. We can turn on a dime, so in many ways, we have huge advantages over commercial brewers. We can brew nearly every style much more easily, with simple adjustments and by adding one or two small changes to our system or process. If we really want to, we can effectively recreate any brewing process (and bier) we like. As such, we can revive time-honored techniques. We can cool our wort in a coolship, and we can krausen our lagers.

Krausening is an extra step in an otherwise step-heavy lager making endeavor, so before adding yet another procedure we might ask ourselves a very basic question, why krausen our lagers? From my perspective, the answer is simple. Without the freshest, strongest yeast, you run the risk of not getting the most out of your lagering efforts. So, for me that question runs parallel to another question, "*Why lager bier*"? I'm going to assume that second question is rhetorical. If you haven't already answered that one, you wouldn't be reading any of this! Still, when pondering important questions like these, I like to have a cold one in hand. In other words, I like to start at the end of the equation, sipping the finished product and working my way backwards. I find it helpful to know in advance exactly what I'm shooting for, before I even begin.

How should the bier look? It should be clear, but perhaps not because I've added anything to make it so. A properly mashed, brewed and fermented bier will clear when it's ready. It needn't be "forced" to clear and it does not usually require finings, filtration or other efforts. Does the bier have a rocky, creamy long-lasting head? I'm not talking about a head that's been created by cranking up the dial on your Co2 tank or from being beaten to death at the taps. Any bier can be made to have a head in these ways, but often times not a very honest one. Are the bubbles small and lazy? I want them itty bitty and



taking their sweet time getting to where they're going. And as I slowly sip my bier, I'd like that foam to stubbornly stick to the sides of the glass, and not evaporate into thin air like so many commercially brewed lagers I've had. Drinking bier for me is as much about these things as anything. A bier displaying these features isn't guaranteed to be a great bier, but I've never had a great bier that didn't have these characteristics, and so I consider all of this mandatory. Proper lagering helps to ensure these characteristics and krausening can play a part in that.

Right about now you are saying, wait a minute, what about my pressure-fermenter? Or my spunding efforts with my lagering kegs? Yes, agreed, you can certainly develop proper conditioning in a lager bier using these methods. There's more than one way to skin a cat and krausening isn't the only way to develop natural condition in your bier. And right about now I'd be remiss if I didn't give you an *atta boy* for developing natural condition in your bier and not simply force-carbonating with bottled gas. You can clearly get the aforementioned characteristics by following those routes to conditioning. As with all things in bier making, the question for me is always, "*How can I make my bier the best it can be?*". In my experience, Krausening has been one of the answers to that question. I've also made what I think are pretty darn good lagers using spunding and pressure-fermenting, the devil is in the detail and krausening offers a way to give your lager bier more support, during the long cold lagering process, when it needs all the help it can get. And that can potentially create a better lager.

As I continue to sip my bier, I decide I like what I see. Tick those boxes; foam, clarity and those small lazy bubbles. But most would argue that how the bier *tastes* is the most important feature of a bier. I don't disagree. And while great-looking does not automatically translate to great-tasting, I've already made my opinion clear; if any of the aforementioned visual cues are missing, it's likely something else will be "missing" on the flavor side as well. This has largely held true for me throughout my years of tasting lager bier. Don't get me wrong, there are good biers about (I'm sure you've had some of them) but good doesn't mean very good, or exceptional. You can decide for yourself if something is "good enough".

As we continue to work our way backwards through the process, it's easy to quickly look at our recipe sheet and review the malt, hops, water treatment, etc. and wonder how all of this will play into the final flavor profile. Certainly, we're also pondering our choice of yeast and wondering what it might bring to the table flavor-wise. But assuming your recipe and process were spot on, the only thing now standing in the way between great looking and great tasting is a flawless fermentation. This might also be the only thing preventing a bier from being excellent vs just "good". For a fine lager, that one small thing is everything. Not only how the bier looks, but of course how it tastes will tell you how successful your fermentation has been. For lager bier, its ultimately a clean, uncluttered and well-attenuated bier we're looking for. Something that showcases your choice of malt and hops and the balance between them. This I think is where a flawless fermentation comes in and where krausening can help.

For any bier, but especially lager bier, managing the fermentation process closely is of paramount importance. I always think the most important part of my brewing process isn't even performed on brew day. It's what takes place after knock-out, once the wort has been chilled, pumped to the cellar and pitched with fresh active yeast. The yeast do the most important job of all and if we don't focus on that portion of the lager making process, the bier will surely end up being something lesser than what we hoped for. In my view, the vast majority of off flavors in bier happen to otherwise lovely wort, only because we took our eye off the ball on the cold side. I have the feeling that many home brewers take a *set-it-and-forget-it* approach to fermentation. It's easy to do since we feel like there really is nothing to do once the yeast is pitched. But making sure the yeast has every advantage to do the very best job it can, isn't doing nothing. I'd argue it's the most important part of the process and much of this starts even before fermentation begins with proper attention to yeast production and yeast health. For

starting your primary fermentation, this might mean taking the time to actually make a starter so that you have plenty of actively fermenting yeast at pitching time. And just prior to lagering, it might be that pitching an active krausen beer can improve your secondary fermentation. That's certainly my belief.

The newly fermenting beer, or "green beer" as krausen beer is often called, contains ample quantities of yeast, at just the right time, with just the right properties and when it is most active. This is quite a shot in the arm for your lager

beer and where the advantages of krausening really shine. Your beer has already been through the war. The yeast that remains will likely continue to ferment, but how well will it do so? Allowing the beer in your primary fermenter to clear as much as possible (dropping as much of the original yeast as possible) and then adding this young

healthy yeast is a way of giving your beer a jump start before it begins its long hard road to perfection (or at least the pursuit of it). This, along with a gentle drop in temperature and a steady downward crawl to near freezing temperatures will give your new krausen yeast the best chance for success. This young healthy actively fermenting yeast doesn't just create bubbles in your beer. It helps to clean-up unfinished business from primary fermentation including diacetyl, acetaldehyde, fusel alcohols and other "green beer flavors". In short, lagering is ALL about the yeast and the healthiest yeast will always do the best job at making your beer taste as clean as possible, particularly when fermentation slows to a snail's pace at 33 degrees Fahrenheit! This is where the rubber meets the road insofar as ensuring the beer we're sipping ends up with all of those critical qualities, not just the visual properties but those finer flavor characteristics as well.

Just a couple of final thoughts before we get to the "How To's" of Krausening beer. There are a couple of wide-spread procedures being used by brewers (both professional and amateur) we should review. While not specifically about lagering, these procedures are closely related and could potentially affect your lager-making efforts. Regardless of how you feel about these topics, I think a bit of critical thinking as to how these might impact the health and welfare of your yeast is worth exploring.

Diacetyl Rests for Lagers – There is nothing wrong with giving your ales a nice diacetyl rest to help chew up this unwanted buttery quality in your beer. Assuming you need it or should do it for lager beer is the question. When I see contradicting information on things like this, it automatically makes me curious and gets me digging deeper. Usually, the first question I have for anything like this is "What are the professionals doing?". With lager beer however, opposing viewpoints on this subject exist at the professional level too, so we should be careful who we consider to be our best mentors on subjects like these. One local lager maker who I've come to respect insists that raising your lager beer for a warm diacetyl rest should not be done. She insists "it makes the yeast lazy", suggesting your yeast won't perform well when it is subsequently dropped to cold, long-term lagering temperatures. Of course, you'll find other commercial brewers who perform diacetyl rests as a matter of routine, for all of their



biers. A quick internet search will give you both pros and cons. The pro argument suggests it's needed while the con says:

“Lager beer should not be raised in temperature for a diacetyl rest because lager yeast typically ferments at very low temperatures, and raising the temperature significantly can lead to the production of more diacetyl, the very compound you are trying to reduce; this is because higher temperatures promote the creation of the precursor to diacetyl, making the diacetyl rest counterproductive for a lager beer”.

Bits of information (or misinformation) abound in the world of brewing and this gets repeated by otherwise very respectable sources to a point where it often appears to be solid intel. Everyone will need to decide for themselves, but I would encourage you to not simply brush this aside. Remember, the health and vigor of your krausen yeast is of paramount importance. You'll ultimately need to decide if you'll add your krausen bier to a 60 to 65 degree wort (15 to 18c), or maintain the same temperature as your primary when adding your krausen bier. And remember my comment above about *“choosing your mentor”*? Tobias Zollo (Master Brewer at *Weihenstephan*) mirrors the con comment above, insisting that doing a warm diacetyl rest will actually create diacetyl where none may have previously existed. Personally, I've scarcely found even a hint of diacetyl in any of my German-style lagers, regardless of the fact that I ferment with a wide variety of lager yeast strains. Conventional wisdom suggests that diacetyl is not easily formed at the optimal temperature ranges for these yeasts (and I would hope this is the range you are shooting for as well). Still not convinced? Then you can add another security measure to your lagering regimen by doing what *Bierstadt Lagerhaus* does; pause at the 40 degree (4 to 5c) plateau for 7 to 10 days as you are slowly working your biers down to the near freezing lagering temperatures. This reputedly provides the necessary time to remove any diacetyl that might exist. Considering the notion that krausening is done in part for this very reason, and I think your need to do a diacetyl rest has been completely removed. Super-charging your lager bier with fresh krausenbier is reputed to clean up all sort of off flavors, including diacetyl.

Cold-Crashing – As a lager brewer, this term has always bothered me. Don't get me wrong, there are many times in brewing where crashing the bier's temperature is helpful but doing so to an actively fermenting bier (or one where you may later need help from any of the remaining yeast) may be counter-productive to your efforts. Maybe you want to cold-crash just prior to filtering, when the bier is completely finished fermenting and you want as much yeast to drop out as possible. It might be just prior to krausening, when you want the primary bier to clear more before adding your krausenbier. I think in both of these scenarios, cold-crashing is fine. In the pre-krausening example, I would only add that getting the temperature of your bier back up to match that of the krausen bier prior to dosing would be important. Otherwise, I would argue that crashing a bier (even an ale) and then expecting any remaining yeast to perform at its best is an unrealistic expectation and potentially catastrophic.

Cold-Conditioning – First and foremost, cold conditioning is not necessarily lagering, even though the two terms are often used interchangeably. If you consider the actual wording here; conditioning is generally understood in this realm to refer to cleaning up and carbonating. Carbonating, in essence means fermentation is happening. So, I guess if I'm critically thinking the process here, what would actually ensure that a bier is “cold-conditioning”? For me, it means actively fermenting that bier at cold temperatures. Therefore, when someone cold-crashes their bier, then force-carbonates it and subsequently puts it in a very cold environment, are they truly cold-conditioning their bier? I'll let you think it through and you can come to your own conclusion. In my mind, this bier isn't lagering, it's simply sitting in a refrigerator. I wouldn't expect that bier to “condition” or improve in any meaningful way. If anything, in this specific example I would expect that bier to slowly deteriorate.

I think we've fully dissected the "why", why we take the time to lager our beer and by default, why we might choose to add the extra step of krausening that beer. So, let's move on to the "how". When I describe the krausening procedures I've developed for my lagering process, I hope you'll know that it's the best process I've come up with to date and it seems to work well. That said, I'm always looking at ways to improve. I hope you'll agree that it's worth considering adding a step that offers the possibility of improving your lager beer. But how you do this and what process you come up with could look very different than mine. There's no right or wrong here and various routes to the same place are likely possible.

Krausening; step-by-step

In a nut shell, my basic process is to collect 10 to 20% of the original wort on brew day, save it until it's needed, then pitch yeast and add the freshly fermenting beer back to the batch at a later point in time.

I make a point of using the exact same strain of yeast used for primary fermentation, but it's unclear to me if this is important. A commercial lager brewery will of course use fermenting beer from a previous batch of the same recipe, simply collecting a percentage of young fermenting beer and pumping it into the new batch, as it is moving into the lagering vessel.



Fermenting Krausenbeer

On Brew Day

As I prepare my kettle for chilling the wort and sending it on to the cellar, I make sure to have my collection container prepared for my krausen wort. Recently I've been using 6-quart Cambro containers with snap-on lids. Typically, it needs to be something that can be frozen since primary fermentation for my lagers seems to take about 2 weeks. My goal is to collect something very close to 6 quarts, with perhaps just a tiny bit of head space to allow for expansion when I freeze the container. And since this wort will need to hang around for a while until I'm ready to use it, I like to soak my container in sanitizer as it sits in the cellar on brew day. My thinking is that the cleaner I keep the wort, the less chance I'll get some kind of flavor degradation as the wort is stored. I brew 10 gallon batches, so this amount is roughly 15% of my batch. It's a significant enough amount of wort that I assume even a slight change in quality would be noticeable in the finished beer. I make sure to have space in my deep freezer for the collected wort. Incidentally, I also make sure to use a container from which I can easily siphon the wort. I suppose you could simply pour the wort into your stove-top boiling pot, but I prefer to minimize the uptake of oxygen wherever I can in my process. Currently my Cambro containers fit this bill.



*Clear wort flowing from the
brewhouse to the cellar*

As the wort begins to flow to the cellar, I make sure to collect only the clearest wort possible. Depending on your level of expertise in getting wort that has fully dropped its trub, there may be some formation of solids in the krausen wort through time. I wouldn't worry too much about this; there seems to be a wide range of acceptability among brewers regarding how much trub we tolerate in our fermenting beer. I'll only say I prefer to ferment as clear a wort as possible, including as little hot break as possible and perhaps just a small amount of cold break might be acceptable. My krausenbeers do seem to ferment better when using clear wort, and that may be an important

consideration in getting a nice strong secondary fermentation in your lagering casks. Regardless, while collecting clear krausen wort will make it easier to siphon clear wort from your container later in the process I think it's safe to assume whatever wort you are fermenting for your main batch, should work fine for krausening as well. Once collected, keep the wort away from sunlight or fluorescent lighting and move it to the freezer at your earliest opportunity.

Let's now assume you are approaching the end of primary fermentation and you are getting ready to transfer your beer from the primary fermenter to your secondary fermenter (aka your "lagering tank"). Three days out from transfer, I'll move my frozen wort to a refrigerator to thaw. The day before transfer (approximately 24 hours from transfer) I'll make a small batch of beer on my kitchen stove, using the krausen wort. I like to siphon the wort from my Cambro container so as to avoid disturbing any settled trub that may have found its way into the wort on brew day. Clear wort is collected into a stainless pot and brought to a boil. In the meantime, my fermentation flask (I use a 5000ML Erlenmeyer flask) sits soaking in sanitizing solution, along with any other equipment needed. For me this means a solid and drilled stopper, a pair of scissors for opening the fresh yeast packet (if using a packet that requires opening this way), an airlock and a small saucer to be used as a place to sit clean/sanitized items. Note that depending on your yeast strain, you might choose a blow-off tube instead of a standard airlock.



Siphoning the krausen wort into my boiling pot

The wort needn't boil for very long and I typically like to end up with as much as possible, so I might only boil it for 10 minutes. You also don't need to add hops. It's already hopped from your brew day. Once transferred to the sanitized flask, it's fitted with the solid stopper and cooled in an ice water bath for about 40 to 60 minutes or so, or until it is cold to the touch and I can be fairly certain it's at least colder than room temperature (I suppose this is one area where my process is somewhat imprecise). Ideally, I suppose I'd like the wort to be near or close to 50F ...or something appropriate for the strain of yeast I'm using. As you already know, I like to avoid shocking my lager yeast in any way that I can. I keep the solid stopper handy for after pitching the fresh lager yeast, so that I can shake the heck out of the flask to provide some level of aeration. The solid stopper is then switched out for the drilled stopper and airlock (or blow-off tube) and the flask is moved onto my stir plate. At first, I keep it in my pantry to ensure things are sealed and starting to "ramping up". After a couple of hours, I move the flask along with the stir plate to my cellar, so fermentation can take place at something closer to what my lager beer is fermenting at.

Transfer and Krausening - The following day my krausen beer has ramped up to a full-blown fermentation. What I'm looking for is lots of activity in the flask with tons of rising bubbles and a layer of foam atop the fermenting krausen wort. If this is the case, I'm ready to transfer my lager to the lagering tank(s) and pitch my krausen beer. I use two 5-gallon kegs as lagering vessels. These will fit nicely into my lagering refrigerators. With any luck, I can draw off fairly clear beer into the casks, but sometimes my lagers aren't as clear as I would like after primary fermentation is complete. This is not unusual,





depending on the strain of lager yeast used and is typically not a huge concern so long as your beer doesn't look like a hefeweizen. One thing I've learned through the years (for ales or lagers) is that too much suspended yeast from primary fermentation can wreck your efforts at secondary fermentation. I'm not certain why this is, but it seems to hold true in my experience. That said, it is often the case that certain lager yeasts will have a difficult time clearing until transferred to a new vessel. I wouldn't worry with this too much, but I do try to get the beer to clear as much as possible before transfer and krausening. Recently I've found the newer versions of the Augustiner yeast to be excellent flocculators and better at clearing a bit more during primary fermentation. Prior and during the transfer, I always flood the casks with Co₂, allowing the cask lid to sit over the opening as I flow generous amounts of carbon dioxide into the cask and allow the beer to run from the primary fermenter to the bottom of the lagering kegs. This is

anything but a "closed transfer" but remember that another advantage to krausening is that fresh hungry yeast will scavenge any available oxygen fairly quickly! An attempt is made to balance the total volume between the two casks and then split the actively fermenting krausen beer between the two casks. I use a magnet to remove the stir bar from the flask and then flame the lip of the flask with a propane torch before pouring off the krausen beer. The lids are fitted back onto each cask with a bit of Co₂ shot into each cask afterwards to seal the lids well (approximately 15 to 20 psi). The casks are then promptly moved to refrigeration, at the same temperature used for primary fermentation. Once the lagering casks have been moved to their new home, I bleed off the Co₂ used to seal the cask lids, down to about 5 psi. No attempt is made to drop the temperature for the next couple of days. I want the krausen beer to begin its work in a stress-free environment. Once the krausen beer is well-acclimated, we can begin lowering the temperature.

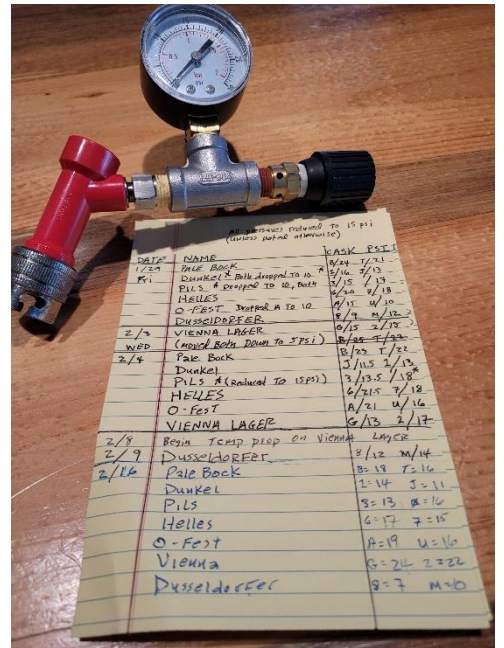
Long Term Lagering

Since I use chest freezers outfitted with temperature controllers for storing an entire brew season's worth of lager beer, I need to use a separate refrigerator to "step down" the fermentation of each batch of beer as I krausen it and move it to the lagering phase. Here again, my focus is on GENTLY lowering the temperature in my step fridge. Here is where I might also incorporate that 40 degree F diacetyl rest discussed earlier. Truthfully, I would be more concerned with this for beers fermented with a Czech lager yeast. Again, the temperature of this tap fridge matches my original primary fermentation temperature. Two days after transfer, I check the pressure. If there's been an increase (even a very slight increase of just 1 or 2 psi, I begin to drop the temperature in the tap fridge by 1 to 2 degrees per day (but no more than this, and if I have the time I will limit it to just 1 degree F per day). Once it reaches the temperature plateau of my larger chest cooler (33F), the two casks are moved to the colder, larger lagering fridge in my tap room and remain there for long-term lagering. If fresh healthy krausen beer has been pitched and the temperatures have been closely monitored, your lager beer will continue to ferment, albeit at a very slow pace even down to freezing or near freezing temperatures. Your lager yeast will then remain active (albeit barely so) for a very long time, not only preserving your beer but "polishing" its character over time. This is what we want and why we use the freshest yeast possible for long term lagering.



Spunding

I always know when I have a batch of beer that was especially well-krausened. There is a significant amount of secondary fermentation taking place in the lagering casks. It's important to release most of this pressure since esters formed during refermentation will need to be released. Not doing so may lead to a build-up of unwanted compounds like sulfur or esters. Things like esters cannot be removed once they've become entrained in your beer. So, blowing off excess carbon dioxide is a good thing and this will help to scrub your beer of flavors and aromas you don't want in the finished product. Certainly, secondary fermentation from krausening will produce far more pressure than you want in your finished beer, so this is why krausening takes place in a cask/keg or some kind of lagering tank with a vent/valve.... and not in bottles! The best way to release pressure is by using what the Germans call a spunding valve. The valve can either be set to release at a specific pressure or pressure can be measured and released manually. I prefer the latter, and usually record my progress along the way, releasing pressure every couple of days at first, then less often as the temperature in the cooler is slowly lowered and things begin to slow to a snail's pace. Eventually, checking the pressure and blowing off excess Co2 might only happen every few weeks. My preferred pressure setting is 15 psi. This will produce approximately 2.8 volumes of Co2 in the finished beer, which provides for a lovely glass of lager beer down the road, when it's time to actually tap the beer.



Spunding valve and record keeping

The Waiting Game

Probably the hardest part of making lager beer is waiting for the finished product. As a brewer, I have a solid work around for this; I always have something in the works and there is always something within reach that's ready to drink. For your lager beer to be the very best it can be, time is needed to let the krausen beer do it's thing. In this case, patience is a virtue. So how long is long enough? Bavarian brewers like to use the formula of 1 week lagering time for every degree plato...plus one additional week. I'm not quite sure why the additional week is tacked onto the end of that formula, but it is. My guess is that this is just another example of those fastidious Bavarians, making dang sure you've given the beer enough time. Following this formula, I might expect the following timeline for any number of my recipes:

<u>Bier Name</u>	<u>Style</u>	<u>O.G./Degree Plato</u>	<u>Lagering Time</u>
Pilsener	Bohemian-pils	1.049 12	13 weeks
Munchener	Dunkel	1.052 13	14 weeks
Oktoberfest	Marzenbier	1.057 14	15 weeks
Pale Bock	Heller bock	1.065 16	17 weeks

You get the picture, but I'd be remiss if I didn't point out a phenomenon that I've noticed through the years, and I'm not certain if it is unique to my process. My beers tend to lager MUCH longer than this, and the longer they do, the better they seem to taste (with a few exceptions). I suppose they lager longer since I always seem to have something around to sip on and I feel no rush to tap into a cask of

lager when there is plenty of bier on hand. Still, everything has its shelf life, but the mug of bier I was sipping as I started this lengthy treatise was brewed nearly 10 months ago and still tastes quite good. To be fair, some of this is possibly a result of my more recent efforts to limit the uptake of oxygen wherever I can in the process.

Clarification and Serving

By now it's clear that I've gone far beyond a simple description of my krausening process. Why stop now and I suppose I should go just a tad further and finish the story.

When I've reached my desired lagering time, I might choose to prepare any given keg for tap service or counter-pressure bottling. To do so, I first check for clarity by throwing a cobra tap onto the keg and drawing off a half liter or two of bier. At this point, we're certainly sipping cloudy bier. If the bier clears



fairly quickly, I might decide to simply put the cask on tap, straight from the lagering keg. Otherwise, I might carefully transfer the bier under pressure into a freshly sanitized serving keg. Here might be a rare opportunity where using a fining agent would be helpful. Doing so won't remove all of your yeast (I actually prefer leaving my bier atop a thin layer of yeast). I see this as a plus and prefer to serve "living bier" from my taps. This small amount of live yeast is another possible reason my lagers continue to condition and improve over time. This, along with the fact that they remain very cold until needed, may ultimately help to extend "shelf life" as well. Whether using an extra serving tank, or simply serving direct from the lagering tank, I typically tilt my kegs to allow the yeast to slump away from the pick-up tube.

OK, I think I need to have another cold lager bier, so let me wrap this up. If you haven't attempted to krausen your lager biers, I hope you'll at least give it a try. If you already do krausen and are only reading this out of curiosity, then I'd love to

hear about your process, or any process you've come up with to improve your biers. I remain convinced that if we aren't moving forward with our brewing efforts, we're stagnating. All philosophies aside, I'm quite sure we should just find a seat in the biergartens one day and sip a glass of lager together. I'm certain we'll come up with something to talk about. Prost! -S