# Technical Question T9:

I am going to go with studying the answer form Hommel which got high praise from the judges. It’s also similar to what I’d write anyhow. If I have time I will re-word it some because my words are easier to memorize. However at this juncture I’m running low on time!

# Technical Question T9. “Krausening, Gypsum & Fining” Answer From Actual BJCP Written Exam: Scored an 84. Got a master grade for this answer

So he got high marks for this answer at around 400 words. I tried typing it almost word for word to illustrate any flaws that didn’t affect the score. Some words I couldn’t read from his scans so I did my best.

Graders Notes: Another excellent thorough answer showing good technical knowledge throughout. Probably your best effort on exam. Discussion includes not just the character, but extensive why and how for each of the three. – Great job.

Adding Gypsum

Gypsum(CaSo4) is a brewing added to adjust calcium and sulfate levels, Added during the mash or boil. During mash it will react with proteins in the malt to lower the PH of the mash and remove temporary hardness thereby reducing residual alkalinity. Depending on the water profile and grain bill this can help get the mash in to the desired PH of 5.2-5.8(preferable ~5.4) Also it boosts the calcium level for healthy ferment yeast needs. > 20ppm of calcium and 75ppm is desired for good hot/cold break and clarity. Sulfate is also increased which will “burtonize” the water giving it a more crisp/dry(>???ppm) character that helps the hops “pop” . Too much sulfate (>400ppm) will make the beer overall harsh.

Fining

Fining is adding fine materials to the boil or post boil to help drop out polyphenols and proteins that can inhibit clarity. The do this w/opposite electrical charges. In boil finings are whirfloc or Spanish moss or carrageen. These help pull together proteins into large egg drop shaped looking flakes that drop out and can be racked off. Post boil finings are isinglass, polycaar, PV?P, Silica Gel and Gelatin. They work similarly by gumming together opposite charge yeast, polyphenols, proteins. The end effects is cleared beer. Isinglass is made from fish bladders(mostly cod ) Polycarr / PVPP is powdered plastic and must be filtered out. Gelatin is non-???? Made from cartilage.

Krausening.

Adding high ferment/actively fermenting wort to the finished beer to clean up diacetyl and aecetyladehyde and to carbonate. Used by some adhere to the reinheibgebot since no sugar or CO2 is required.

Some brewers save wort and make a starter w/it as ~10-20% of final volume. Other breweries rack for an active beer to a finished beer.

Issues can be infection in variable carbonation due to more difficult calculations.

# Technical Question T9. “Kräusening, Gypsum & Finings”

# Discuss the brewing techniques a) kräusening, b) adding gypsum, and c) fining. How do they affect the beer? Address the following topics:

|  |  |
| --- | --- |
| **50%** | **Describe each characteristic.** |
| **50%** | **Identify the effect on the finished beer.** |

**1) Adding Gypsum**

**Describe:** Gypsum (calcium sulfate, CaSO4) is a common brewing British salt, found naturally in high levels in the water of Burton-on-Trent. It is an important part of “Burton salts” used to impart increased hop bitterness to English pale ales and IPA. When added to brewing water, it increases the level of calcium (Ca++) and sulfate (sulfate (SO4- -) ions.

***Effect on Beer:*** When added in proper amounts, gypsum *aids the mash by adding necessary calcium* (at least 50 ppm of calcium are necessary for proper mash enzyme function) and *adjusting mash pH* into the optimum range. Calcium also *aids yeast nutrition*, resulting in shorter lag times once yeast is pitched and faster, healthier fermentation.

*Sulfate ions impart dryness and fuller, more lingering bitterness* to beer but can be astringent in excess. Sulfates also *aid alpha acid extraction* from hops and increase the perception of hop bitterness. These effects become more concentrated at 150-350 mg/l. Above 400 mg/l sulfate becomes highly bitter.

Excessive levels of gypsum *can give beer a harsh minerally taste and unpleasant hop bitterness*; this is a common homebrewing mistake, especially for brewers using old English recipes which call for adding a teaspoon of gypsum.

Gypsum is best used when adjusting low or moderate hardness, low sulfate water to mimic Burton water when brewing English-style bitters, IPA and strong ales. It isn’t necessary when brewing with water which naturally has high levels of carbonates and sulfates.

When attempting to adjust water to mimic Dortmund water, it is generally better to add Epsom salts (magnesium sulfate) instead - as long as magnesium levels don’t go above 30 mg/l. In any case, gypsum should be added carefully to avoid excessive amounts.

**2) Finings - Repeated from Cloudiness in Troubleshooting**

***Describe:*** Finings are a solution of fine particles which are added to wort or green beer in order to *increase the rate at which suspended material flocculates* and falls out of solution. Fining particles are positively or negatively *electrostatically charged*, so that they attract other particles to them. The larger clumps of material precipitate faster. *At least 50 mg/l calcium is necessary* in the wort or beer in order for most finings to work. All types of finings clarify beer and aid flavor stability.

***Effects on Beer:*** There are two classes of finings, which can be added at different stages of the brewing process:

**1) Kettle/Copper Finings:** Help coagulate hot break, - proteins responsible for protein/chill haze and flavor instability. All work by coagulating proteins. Typical kettle finings are: *Irish moss* (dried seaweed - Chondrus *Crispus -* at 50 - 150 mg/l), *ProtoflocTM* (30 mg/l), *carrageen* (a gum used in food production - derived from seaweed), and *WhirlflocTM* (20-60 mg/l). All are added at the rate of approximately 1 tsp or tablet/5 gallons in the last 15 minutes of the wort boil.

**2) Fermenter/Cold Side Finings:** *Either added to conditioning vessel* near the end of conditioning period *or added to the cask* (for cask-conditioned ales). *Used to remove yeast, protein, polyphenol or starch hazes.* Fining are often packaged as powders and must be rehydrated using sterilized hot water. They take time to work - at least 25 hours.

Common yeast flocculants are *isinglass* (dried collagen obtained from the dried swim bladders of fish, historically sturgeon or cod, now various fish species from the South China Sea. Added at 1-3.5 mg/l at 42-55 ºF), *brewers’ gelatin (added at 60-90 mg/l - not as effective as isinglass).* These finings work best if the beer is cold (below 50 °F).

*PolyclarTM* or PVPP (tiny beads of polyvinyl pyrrolidone - plastic) is a polyphenol binder used to remove chill haze (6-10 g/5 gal).

S*ilica gel* is a protein binder used to remove protein haze (usually added at 1-3.5 mg/l).

**3) Kräusening**

***Describe:*** Kräusening is a technique where *a portion of actively fermenting wort* (from another batch of beer at the high kräusen phase of the Fermentation stage of the yeast’s life cycle) *is added to green beer* which has finished fermenting (where the yeast is at the Sedimentation stage of the yeast life cycle), just prior to packaging.This *provides active, healthy yeast to supplement dormant/dying yeast lost during extended lagering.* It is most commonly used when making German lagers or wheat and rye beers.

This technique is often used by commercial brewers who brew the same varieties of beer on a regular schedule. Even for those brewers who don’t bother with the Reinheitsgebot, the practical benefit is that you can top up the headspace in your conditioning tanks with kräusen once fermentation subsides, increasing the volume of beer in your tanks and possibly freeing up tank space.

*Typically, 10-20% of fresh wort is added* depending on desired level of carbonation and batch size. For a 5 gallon batch of homebrew, this works out to 2-4 quarts. When homebrewers use this technique, they generally make a second yeast starter, sometimes using canned wort from the batch of beer to be kräusened, and add that to the raw beer.

The practice of adding unfermented wort (speise) to carbonate finished beer is related to kräusening, but technically isn’t the same thing.

***Effects on Beer:*** For brewers who wish to comply with the Reinheitsgebot, kräusening *provides natural carbonation* for beer without adding sugar or artificial carbon dioxide. Actively fermenting yeast *helps scavenge VDK (diacetyl) & acetylaldehyde* still present in the packaged beer, and *also helps fully attenuate high gravity lagers.* Conversely, yeast in the *kräusen can also impart these off flavors* if they can’t complete their fermentation in the bottle. *Kräusening can also result in infection* of the bottled beer, or the beer from which the kräusen came, if the brewer doesn’t practice proper sanitation procedures. Finally, if the wort used to kräusen isn’t identical to the beer to be kräusened, *the brewer must recalculate vital statistics* like ABV, IBU and SRM.

# T9. Gypsum, Fining & Krausening Question

# Discuss the following brewing techniques. How do they affect the beer? (a) adding gypsum, (b) fining, (c) kräusening.

**A. Adding gypsum:** Accomplishes 2 things: increasing Ca++ and SO4--; Calcium helps yeast metabolism in proper levels, and also allows the wort to acidify. It is also critical to proper enzyme function. Sulfate lends soft edge to hop bitterness by affecting alpha-acid extraction & creating a synergistic perception effect.

**B. Fining:** Addition of kettle finings (Irish moss) to coagulate proteins to clarify beer. May also be carried out post-fermentation (Isinglass, Bentonite, Polyclar) to help precipitate tannins and/or proteins that may cause haze, or even flavor instability.

**C. Kräusening:** The addition of a portion of actively fermenting wort to wort that has finished fermenting. Used chiefly as a means of providing "natural" carbonation. Also reduces residual diacetyl & may contribute acetaldehyde ("green" beer character) in the finished beer.

*Kräusening is a German technique where a portion of actively fermenting wort (from another batch of beer at the high kräusen phase of the Fermentation stage of the yeast’s life cycle) is added to green beer which has finished fermenting (where the yeast is at the Sedimentation stage of the yeast life cycle), just prior to packaging. This provides active, healthy yeast to supplement dormant/dying yeast lost during extended lagering. It is typically used when making German lagers or wheat and rye beers in order to comply with the Reinheitsgebot and to provide sufficient healthy yeast to properly bottle condition the beer.*(Brewers who force carbonate their beer comply with the Reinheitsgebot by using carbon dioxide collected during yeast fermentation.)

Kräusening is often used by German commercial brewers who brew the same varieties of beer on a regular schedule. Even for those brewers who don’t bother with the Reinheitsgebot, the practical benefit of kräusening is that they can top up the headspace in their conditioning tanks with kräusen once fermentation subsides, increasing the volume of beer in their tanks, reducing headspace and possibly freeing up tank space.

*Typically, 10-20% of fresh wort is added depending on desired level of carbonation and batch size.* For a 5 gallon batch of homebrew, this works out to 2-4 quarts. When homebrewers use this technique, they generally make a second yeast starter, sometimes using canned wort from the batch of beer to be kräusened, and add that to the green beer.

The practice of adding unfermented wort (speise) to carbonate finished beer is related to kräusening, but technically isn’t the same thing.

***Effects on Beer:*** *For brewers who wish to comply with the Reinheitsgebot, kräusening provides natural carbonation*for beer without adding sugar or artificial carbon dioxide. *Actively fermenting yeast helps scavenge VDK (diacetyl) & acetylaldehyde* *still present in the packaged beer, and also helps fully attenuate high gravity lagers.* Conversely, yeast in the *kräusen can also impart these off flavors* if they can’t complete their fermentation in the bottle. *Kräusening can also result in infection* of the bottled beer, or the beer from which the kräusen came, if the brewer doesn’t practice proper sanitation procedures. Finally, if the wort used to kräusen isn’t identical to the beer to be kräusened, *the brewer must recalculate vital statistics* like ABV, IBU and SRM.

# My Completest Answer to T9.

|  |  |
| --- | --- |
| Describe | Effect on Beer |
| Adding Gypsum | Gypsum = Calcium Sulfate (CaSO4). \* Part of “Burton salts.” \* Found naturally at high levels in Burton-on-Trent water. \* Increases Ca++ and SO4-- levels. \* Ca++: - Helps yeast metabolism in proper levels. - Lowers wort pH. - Interacts with phosphates in malt to form Ca3+(PO4)2 + 2 H+ ions, reducing residual alkalinity & mash pH. - 50+ ppm needed for proper mash enzyme function. \* SO4: - Aids alpha acid extraction. - Increases perception of hop bitterness. - Imparts drying, bitter flavor in excess. - Can impart sulfury notes in excess. \* Commonly used for English IPA & pale ales. |
| Finings | Compound added to wort or green beer to clarify it. \* Electrostatically attracts charged suspended particles, making them flocculate, thus precipitating faster. \* 50+ mg/l Calcium in H2O necc. for finings to work. **Kettle/Copper Finings:** Irish moss (dried seaweed - Chondrus *Crispus*), carrageen or WhirlflocTM Added in last 15 minutes of boil. Helps to remove hot break - proteins responsible for protein/chill haze & flavor instability. **Cask/Fermenter Finings:** Added to Secondary Fermenter. Gelatin, Polyclar (PVP, polyvinyl pyrrolidone), Isinglass (dried, powdered swim bladders of fish - historically sturgeon, cod), SparkloidTM or Silica gel. Negatively charged. Coagulates suspended proteins and polyphenols (tannins) responsible for chill/tannin haze & flavor instability. Also aids yeast flocculation. |
| Kräusening | Adding a portion of actively fermenting wort (from another batch of beer at High Kräusen/Fermentation stage of yeast life cycle) to green beer which has finished fermenting (Flocculation/Sedimentation Stage), just prior to packaging. \* Provides active, healthy yeast to supplement yeast lost during long lagering. \* \* Gives natural carbonation without adding corn sugar or artificial CO2, to comply w. Reinheitsgebot. \* Actively fermenting yeast helps scavenge VDK (Diacetyl) & Acetylaldehyde. \* Can help attenuate beer to lower FG. \* Can contribute acetaldehyde ("green" beer character) and diacetyl to finished beer. \* Possible source of infection (if other batch of beer infected). \* Us. added at 2 qt. Kräusen/5 gal. beer. |