

BREWING HIGH GRAVITY BEERS



Five Things You Should Know

THE FIVE

- Yeast Count
- Sugar
- Oxygen
- Fermentation
- Temperature



YEAST COUNT

- Know the Pitch Rate
 - Over Pitching can be as bad as under pitching because yeast will consume nutrients and oxygen too fast and go dormant before consuming all wort sugars.
- Calculate required yeast cell count
(www.malty.com/Calc/Calc.html)
- White labs vile of liquid yeast has 70-140 Billion Yeast Cells
- Always make a yeast starter to initiate cell activity and increase cell count if the original gravity is over 1.060



SUGARS

- Higher mash temperature yields more complex sugars that don't ferment as well.
- Yeast consume sucrose which it eats first and quickly, then glucose and fructose.
- Maltose is consumed next. It makes up ~60% of wort sugars and is most responsible for beer flavor.
- Complex sugars like maltotriose are consumed last. More flocculent yeasts are better at fermenting these sugars.
- The attenuation you are able to achieve is dependent on mash temperature and the type of yeast you use.
- Some beers, like barleywine will require you to add malt extract if the grain bill may exceed your mash tun capacity. Especially if you have efficiency issues.
 1. Use a yeast nutrient if you must supplement your wort with malt extract or non-malt sugar.

OXYGEN

- Yeast have over 20 enzymatic reactions that require oxygen
- Oxygen Helps yeast produce sterols among other things.
- Sterol is a class of steroid that help yeast membranes become permeable...because they don't have mouths.
- Not adding enough oxygen can lead to a stuck fermentation with big beers.
- 8 - 10 PPM of dissolved oxygen is the rule of thumb:
 - Shaking: 4 PPM
 - Fish Tank Pump: less than 8 PPM
 - Pure Oxygen is recommended for high-gravity beers



FERMENTATION

- Phases of Yeast Fermentation:

1. **Lag:** 0 - 15 hours yeast use minerals, and amino acids (Nitrogen) from the wort and oxygen injected by the brewer to build protein.
 1. A second oxygen injection is recommended for big beers 12-18 hours after pitching yeast to prevent yeast from depleting its oxygen supply before attenuation is complete.
2. **Exponential Growth:** 4 hrs. - Yeast work for 4 days consuming sugar & producing CO₂, ethanol, and flavor compounds.
3. **Stationary Phase:** Yeast spend the next 3 - 10 days conditioning the beer by cleaning up diacetyl (buttery flavor) and acetaldehyde (fruit-like esters).
 1. Check attenuation. Big beers may require more yeast to be added. Lager yeast is recommended when this is necessary.

TEMPERATURE

- Starting fermentation 5 degrees above target fermentation temperature until the exponential growth phase starts can help if you under pitch.
 - HOWEVER, this can cause more diacetyl so be sure to do a diacetyl rest if you go this rout.

