Tech Corner

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Have you ever had problems with a weak fermenting batch of beer?
In previous articles we mentioned the importance of pitching the proper amount of healthy yeast to avoid problems like acetaldehyde which imparts an aroma and flavor of freshly cut green apples to your beer. Another potential problem from pitching low levels of yeast is elevated levels of diacetyl. Diacetyl adds a buttery or butterscotch aroma and flavor to your brew. Also, it is important to pitch the appropriate amount of healthy yeast to avoid a stuck fermentation, which means the yeast quit working before the fermentation is complete. Finally, you need strong healthy yeast to prevent wild yeast and other bacteria from gaining a strong hold during fermentation.

In this article we discuss the appropriate amount of yeast to pitch and how to achieve this level by making a yeast starter.

According to George Fix, the appropriate level of yeast to pitch for ales is 750,000 yeast cells per milliliter of wort for each degree Plato of wort. Mathematically,

Ale pitching rate =

750,000*(mL of Wort)*(°Plato of Wort)

The pitching rate for lagers is twice the amount shown for ales.

Before we apply the formula recall that 5 gallons is 18,926 mL and to convert from Plato to Specific Gravity (SG) we multiply by about 4. That is, °10 Plato is roughly 10*4 =40 gravity units (SG of 1.040) and °12 Plato is roughly 12*4 =48 gravity units (SG of 1.048). Now, as an example of the formula, suppose you want to make 5 gallons of your favorite ale with original gravity equivalent to °14 Plato (i.e. SG 1.056), how many yeast cells should you pitch into the fermenter? The answer is:

=750,000*18,926*14
=198,723,000,000

or, around 200 billion yeast cells.
It is worth noting that large smack packs from Wyeast contain around 100 billion viable yeast cells. Therefore, in our example you would need two such packs to pitch the appropriate amount of yeast. The tubes from White labs also contain around 100 billion yeast cells, so in our example you would need two of the White labs tubes.

As an alternative to pitching multiple packs of liquid yeast, you may consider making a yeast starter. To make a 2000mL yeast starter you need the following items:

- 2000mL Erlenmeyer Flask
- Light Dry Malt Extract (DME)
- Yeast Nutrient Pack
- Liquid Yeast (smack pack)
- Foil
- Sponge
- Stir Plate (optional)

To make a 2000mL yeast starter, remove your liquid yeast from the refrigerator, if it's a smack pack then smack it and wait until it puffs up, which takes about one day. Add around 7 ounces of DME and a pinch or two of yeast nutrient to the Erlenmeyer flask, and fill the flask to the 2000mL level with "good" brewing water. Next, place the flask on the stove and boil for 15 minutes (watch out for a boil over). If the flask is a little full for your boiling comfort zone, then you can boil in a larger pot or just proportionally reduce the amount of water and DME in the flask to maintain SG 1.040. Remove the flask from the stove and place aluminum foil over the top of the flask and cool it to around 75 °F. Aerate the starter by shaking or adding oxygen directly. Add the liquid yeast (for smack packs make sure the yeast package is puffy), now around room temperature, to the starter and place a sponge just inside the top of the flask. The sponge will allow CO_2 out and O_2 in. Note that if you use an airlock you will lock out oxygen; however, propagating yeast need oxygen to multiply. Place the flask onto a stir plate for about 18 hours at room temperature and then pitch the entire contents of the flask into the wort to begin fermentation. If you do not own a stir plate then during the 18 hour propagation phase mentioned above, shake the flask every few hours to aerate the starter.

If you would like to read more about yeast pitching rates and yeast starters here are two good resources:

www.mrmalty.com/pitching.php

and

An Analysis of Brewing Techniques, by George J. Fix