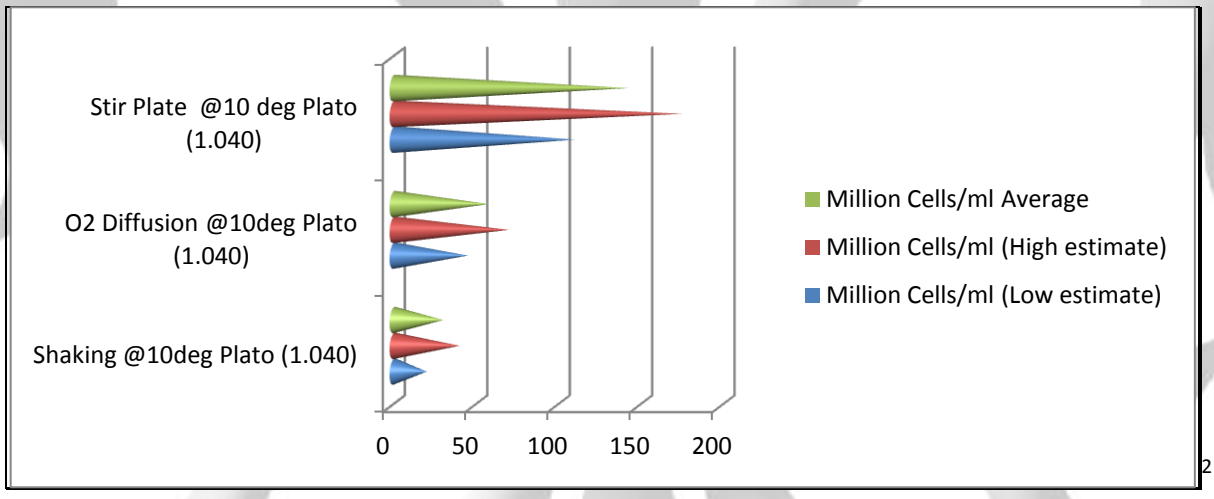
BELGIAN ALE PITCHING RATES

There are many good yeast starter guides and a number of excellent books detailing the how-to of creating stir-plate starters. We highly recommend Chris White and Jamil Zainasheff's volume for detail and academics[1]. This document is intended to be a quick reference sheet for selecting the correct pitch rate for high gravity ales 1.060 and higher.

Cell Count

Identifying the ideal cell count, (pitch rate), is essential for controlling the duration of fermentation and the quality of ester development. Crafting a starter + fermentation plan is every bit as critical as composing a bill of fermentables or hops schedule and possibly more so. The figure below demonstrates common densities of yeast cells per milliliter. For the brewer without a lab the basis for all starters is an assumption of cell count from a commercial vial or yeast pack. A White Labs vial of yeast will contain approximately 80-120 billion cells depending on the production date. This count estimate is the basis for the build-up of yeast cells for a starter. Figure A is an illustration of yeast densities per cultivation method:



[2]

Figure A: Estimated Yeast Cells /ml

Knowing the average cells per milliliter in a stir-plate starter makes choosing a yeast pitch rate much simpler. Table 1.0 below details the cell count required for many well known Belgian ales. Of course a pitch rate in this guide always assumes healthy yeast, proper temperature, and growth in nutrient balanced oxygenated 10P wort. Based on this we can select the stir plate starter size at the far right column and also note the required *starter seed rate* in the adjacent

[1] White, Chris, Zainasheff, Jamil. "Yeast, The Practical Guide to Beer Fermentation". © 2010, Brewer's Association.

[2] A stir-plate starter in a nutrient balanced 10P wort infused with O_2 during its approach to high krausen can easily produce 160-170 million cells/ml presuming an initial starter pitch rate of 80-85 million cells/ml.

column to compose the right starter. This chart is based on practiced small batch high gravity brewing over an extended period and is an empirical working model.

Pitch Rate

The phrase *starter size* can be somewhat misleading. For instance, a 1000ml stir-plate starter could have a wide range of cell counts anywhere from 100 billion to 170 billion cells depending on the culture media and the cultivation method. The table below presumes a 5.00 gallon batch, a healthy 10P wort infused with O_2, proper temps for yeast growth, the requisite starter seed rate, and time for cultivation (18-24 hours).

Ale's OG	Ales	5.0 Gal Ale Pitch Rate (Billions) [3]	Starter Seed Rate (Billions)	Stir Plate Starter Volume (ml)
1.060		150	50	1050
1.061	La Trappe Blonde, Chimay Red	155	55	1100
1.062		160	60	1120
1.064	Westmalle Dubbel	170	70	1190
1.066	La Trappe Dubbel, Leffe Blonde	180	75	1260
1.068		190	80	1330
1.069	Maredsous 8	200	90	1400
1.070	Duvel	210	105	1470
1.072	Rochefort 6, Westvleteren 8	220	110	1540
1.074	St. Feuillien Tripel	230	115	1610
1.076	La Trappe Tripel	240	130	1680
1.078	Achel Tripel, Rochefort 8	250	135	1750
1.079	Chimay Grande Reserve	260	140	1800
1.080		270	145	1890
1.081	Westmalle Tripel	275	150	1900
1.082		280	150	1960
1.084		290	155	2030
1.086	La Trappe Quadrupel	300	155	2100
1.088		310	160	2170
1.090	Westvleteren 12, Achel Bruin Extra	330	165	2310
1.092	Russian Imperial Stout	340	170	2380
1.094		350	175	2450
1.096	Rochefort 10	360	180	2520
1.098		370	185	2590
1.100		390	190	2730

Table 1.0[4]

[3] Lagers must double the pitch rates listed here.

A Sample Starter: Westmalle Tripel

When trialing a Belgian ale, (such as the Westmalle Tripel which is under trial at CSI now), the pitch rate is estimated by cell count. A starter plan is then created to match the appropriate pitch.

Westmalle OG: 1.081

Estimate of Required Cells: 275 billion

Starter Plan: Prepare 1900ml sterile 10P wort with recommended Wyeast nutrient. Pitch 1.25 vials of White Labs *fresh* yeast. Diffuse O_2 in wort for 20 seconds, pitch seed yeast, and initiate stir plate. After 6 hours repeat O_2 diffusion. At 18-24 hours the yeast will have consumed the wort and replicated to 260-290 billion cells depending on the original cell count. Magnetically remove the stir-bar, chill for 12+ hours, decant the beer from the flocculated yeast down to about 200-300 ml. Just prior to brew day let the yeast warm up to pitch temperature (64-68F) for about 6 hours. Add chilled wort to the flask and slurry to make sure all of the yeast is in suspension then pitch.

Primary Observation: Ferment at the manufacturers recommended temperatures. Observe the fermentation closely and record the time to FG. If attenuation to target FG took only 2 days then the pitch must be reduced until the duration is appropriate for the style. The Westmalle Tripel for instance should reach FG in about 5 days. If fermentation took 12 days then the pitch health and size should be refactored until it matches the fermentation timeline.

Notes: Most Belgian ales should complete primary fermentation in about 5-8 days depending on the style. Extended primary durations are not recommended. After primary, the ale should be removed immediately from the yeast, (yeast dump or rack to secondary). Be careful not to oxygenate the ale if decanting to secondary. Most stated secondary temps for Belgian ales are anywhere from 34F to 50F. It is important to keep in mind that secondary for a Belgian ale halts aggressive fermentation, maintains and matures the ester profile, and begins to clarify the ale.

---

[4] Based on Palmer's scalar growth model for starters. For instance, a starter of 2300 ml seeded with 150 billion initial cells can achieve 330+ billion cells. Palmer, pp. 101-102.