How to Get More Value

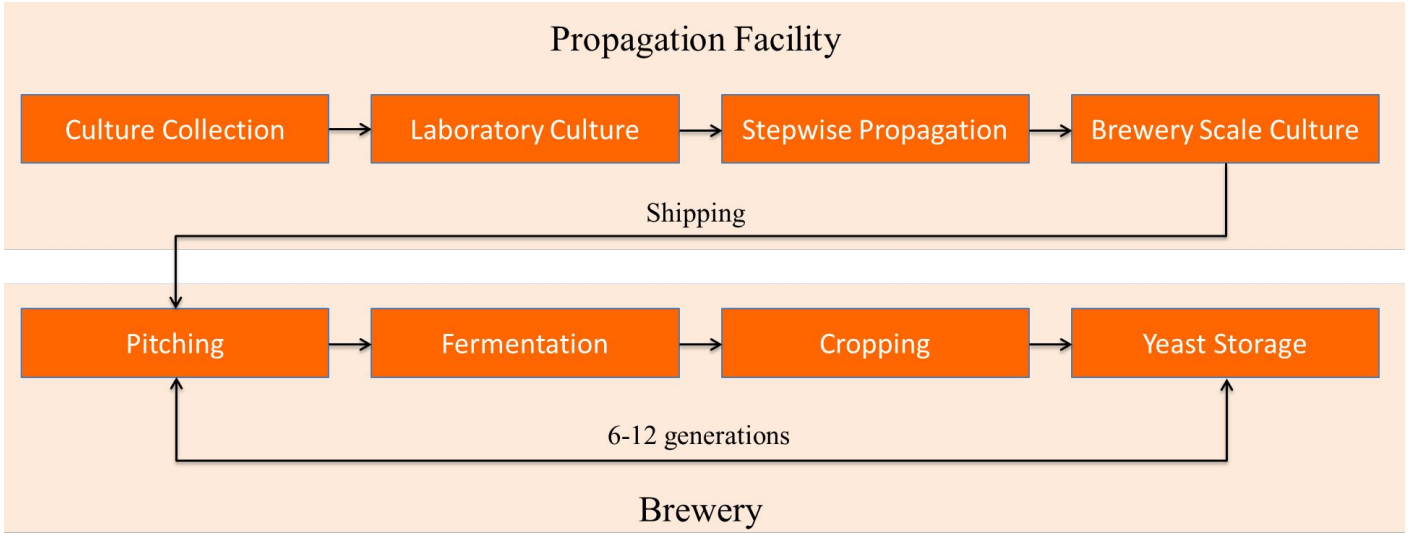
Quantifying Yeast Cost

Jacob Hoover
Sales Development Specialist

Learning Objectives

- Understanding your lab-grown culture
- Managing yeast health and flavor production
  - Health & Quality = Generations
- How to properly collect, store, and repitch yeast
  - Generations = Savings
- Techniques for getting the most value:
  - Harvest and Reuse
  - Split Generation
  - Double Batching
  - Pitch Lagers Warmer

Yeast Culture Cycles



Generation “0”

Liquid yeast grown from Gen-0 in a lab is healthier than the yeast at the bottom of the fermenter:

- Grown in the presence of O2
- Low alcohol production
- Cell physiology
- Glycogen levels
- High viability (95%+)
- Little to no presence of hop matter and other trub

Differences in Starting Culture

	Dry Yeast	Liquid Yeast
Viability	Varies between 3-5 x 10^9 viable cells per gram Typically 60-80% viability	White Labs liquid cultures are 2.15 x 10^9 per mL and >95% viable
Pitch Rate	Pitch rates are estimated due to unknown viability, 50-100g/hL	Precise cell counts, allowing accurate custom calculations for pitch rate
Quality Control	Detection of bacterial and wild yeast contaminants per 1-10 million yeast cells	Detection of bacterial and wild yeast contaminants per 300 million yeast cells.
Repitching	Can be repitched with good yeast handling	Repitchable for multiple generations with good yeast handling

Planning and Documentation

Strategy Before In-House

Plan before placing yeast orders:

- What brands will/can it be used in?
- How often will it be used?
- Fermentation timelines for each brand to aid with scheduling

House Ale Yeast
Pale Ale
IPA
American Wheat
Blonde Ale
Amber Ale
Porter
Imperial Stout

Belgian Wit Yeast
Witbier
Farmhouse Ale
Belgian Blond

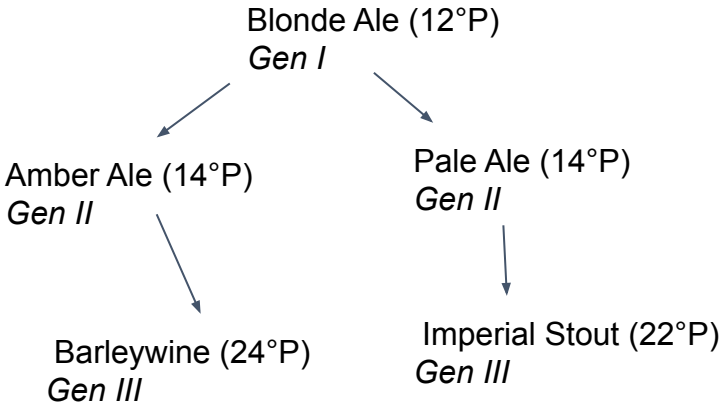
Planning and Documentation

Tracking Your Yeast

It is important to know your cultures lineage

- What gravity beer did this come from?
- What was the quality of fermentation(s)?
- What generation is this culture?

- If increasing gravity, use cultures from lower gravity fermentations



10bbl, 15P, 66F
- Fresh liquid pitch - $400-$500

10bbl, 25P, 66F
- Fresh liquid pitch - $1000-$1500

Lifecycle of Yeast

Early fermentation

- Yeast uses all the dissolved oxygen; there is no detectable uptake of glucose

8-16 hours

- First sign of active fermentation

24 hours

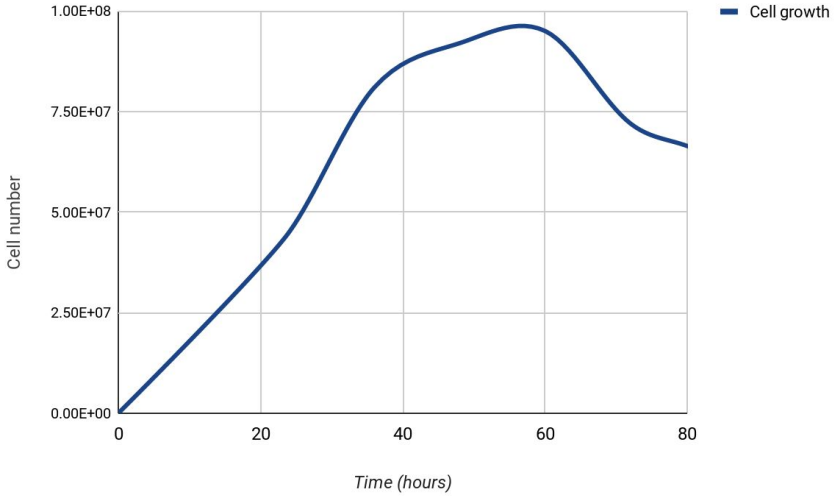
- Budding yeast cells observed
- The temperature, if uncontrolled, rises due to heat generated by the fermentation

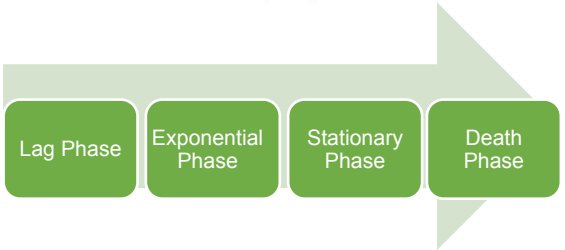
24-48 hours

- The rate of yeast growth and carbohydrate assimilation reaches a maximum

Post 48 hours

- The pH falls to a minimum of 3.8 - 4.4 before rising slightly towards the end of fermentation





Requirements for Fermentation

Yeast Nutrition

Carbohydrates (carbon source: malt sugars)

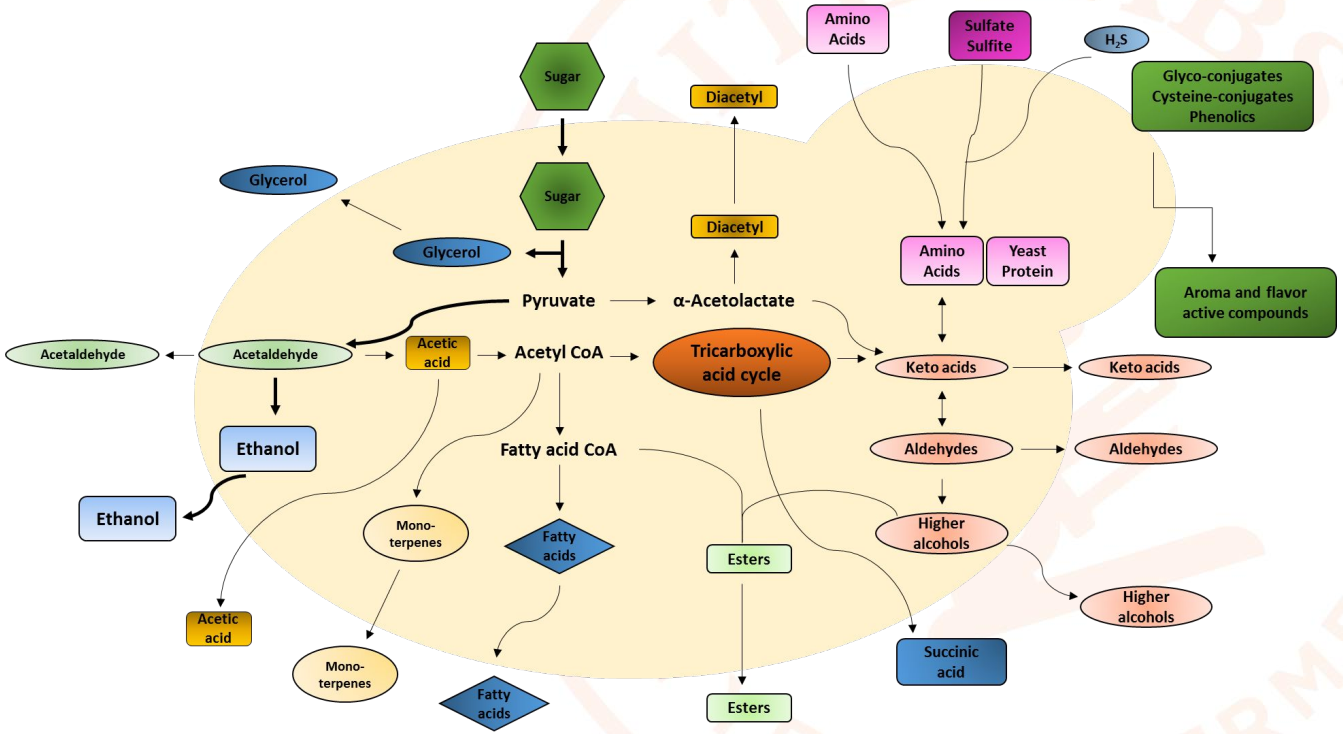
Amino acids (nitrogen from malt)

Minerals (Zinc)

Vitamins (from malt)

Oxygen (from aeration or agitation)

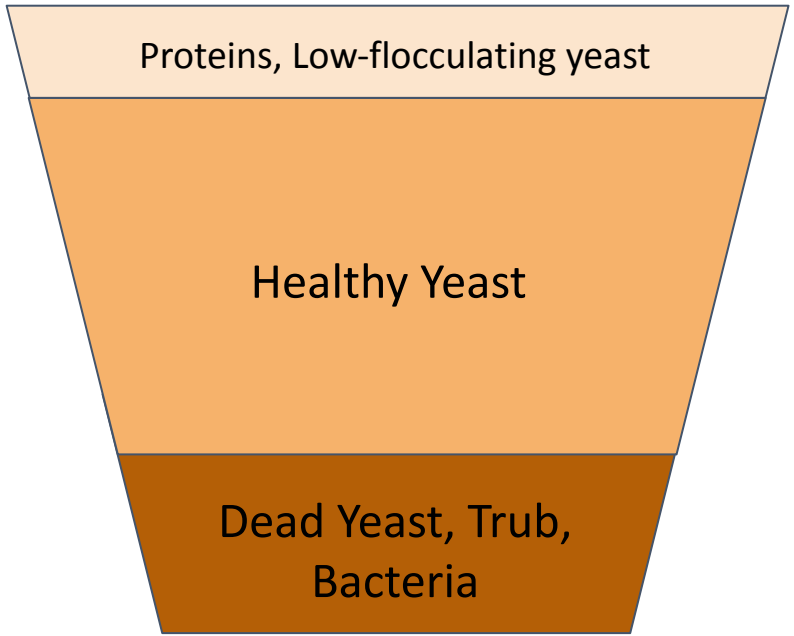
Yeast Flavor Development



Collecting Yeast

Important to Collect Yeast in a Healthy State:

- Time
- Temperature
- Strain dependent
- Cone/Fermentor Shape Dependent
- Immediate reuse is ideal



Yeast Storage

Conditions

Objective: Keep metabolic activity to a minimum to preserve viability and vitality

Temperature	Time	Oxygen	CO2
33-36°F	Ideally 1-3 days, no more than two weeks	Avoid oxygen pick-up, causes rapid depletion of glycogen reserves	Vent pressure, stressor on stored yeast

Yeast Repitching

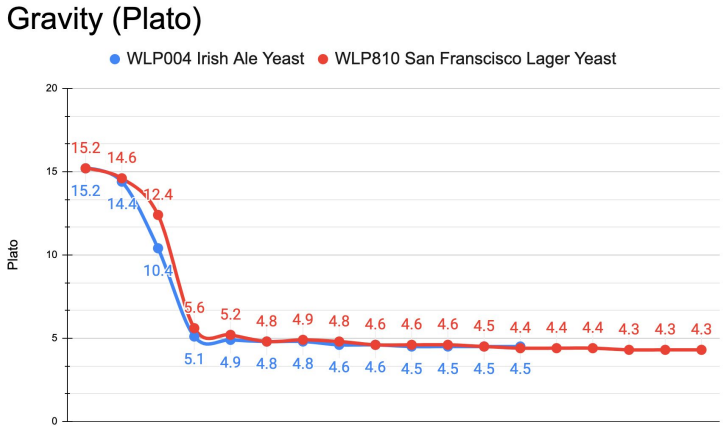
Culture OK for Reuse?

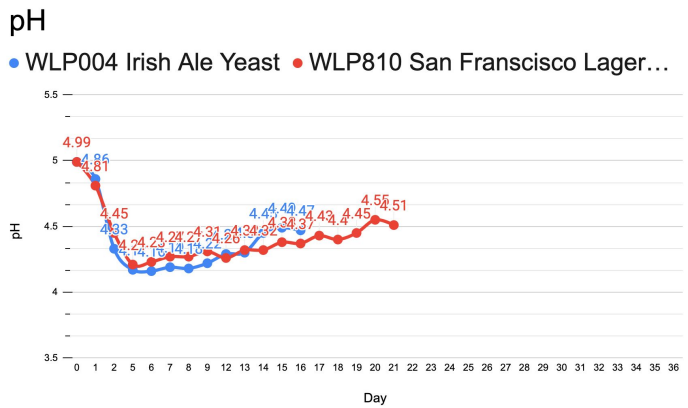
Monitor

- Lag Time
- 48hr attentuation and pH
- Fermentation Timeline
- Attenuation
- Harvest Volumes
- Biomass

Additionally with a lab:

- Cell Count
- Viability





Yeast Repitching

How much yeast do I need?

Viability

Weight (lbs.)

NOT ACCOUNTING KEG WEIGHT (29.7LB/13.5KG)						
Cell Concentration: 1.5 bio/mL						
BBL	Pitch Rate	100%	95%	90%	80%	75%
1	7500000	1.49	1.57	1.65	1.86	1.98
3		4.46	4.70	4.96	5.58	5.95
5		7.44	7.83	8.27	9.30	9.92
7		10.41	10.96	11.57	13.02	13.89
10		14.88	15.66	16.53	18.60	19.84
15		22.32	23.49	24.80	27.90	29.76
20		29.76	31.32	33.06	37.20	39.68
30		44.63	46.98	49.59	55.79	59.51
40		59.51	62.65	66.13	74.39	79.35
50		74.39	78.31	82.66	92.99	99.19
60		89.27	93.97	99.19	111.59	119.03
90		133.90	140.95	148.78	167.38	178.54
120		178.54	187.94	198.38	223.17	238.05

Lots of Options to Maximize Yeast Value

All Require **Handling and Reusing Yeast:**

- Harvest and Repitch to Same Volume
- Split Harvest Generations
- Double Batching
- Warm-Pitch Lagers
- Propagation

★ What is your target yeast cost?

★ How much beer production to achieve this?

★ What efficiencies in yeast handling to get there?

Method 1: Harvest and Reuse

STATS

Brewhouse Size	10bbl
FV Size	10bbl
OG	15P
Pitch Volume	3.5L
Cost	$458
Yield	198 pints/bbl (80% yield)

*Estimate= 5-6x cell growth

WHITE LABS®
PURE YEAST & FERMENTATION

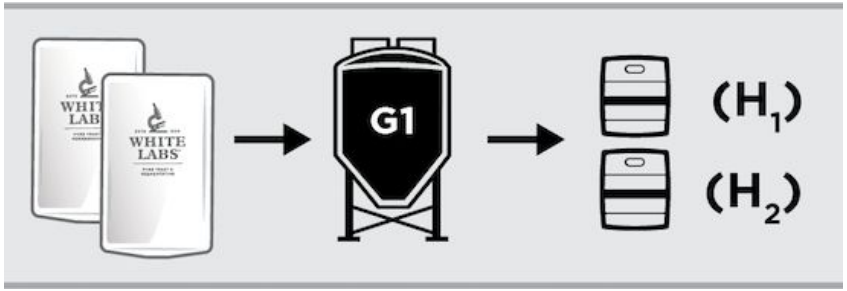
YEAST COST WHEN HARVESTING TO A SINGLE TANK OVER 6 GENERATIONS

Gen 1	FV1 Pitch Volume - 3.5L Harvest Volume - 10L*		$45.80/bbl
Gen 2	FV2 Pitch Volume - 10L Harvest Volume - 10L		$22.90/bbl
Gen 3	FV3 Pitch Volume - 10L Harvest Volume - 10L		$15.27/bbl
Gen 4	FV4 Pitch Volume - 10L Harvest Volume - 10L		$11.45/bbl
Gen 5	FV5 Pitch Volume - 10L Harvest Volume - 10L		$9.16/bbl
Gen 6	FV6 Pitch Volume - 10L Harvest Volume - 10L		$7.63/bbl

- Standard harvest and repitching technique used to transfer yeast FV to FV
- Pitch 10bbl -> Harvest (H_1) -> Repitch 10bbl -> Harv
- Viability and vitality (quality) of  promotes generational use
- Yeast harvests have higher cell population promoting healthy repitching rates

Splitting Harvest Generations

- Strategy increases cost efficiency over the “harvesting to a single tank” method
- Pitch 10bbl -> Harvest x2 (H_1 & H_2) -> Repitch H_1 -> Repitch H_2 -> Harvest x4 ->...
- Culture growth allows total harvest volume to be split into two re-pitchable cultures
- Method continues to multiply and preserves generational use



Method 2: Splitting Generations

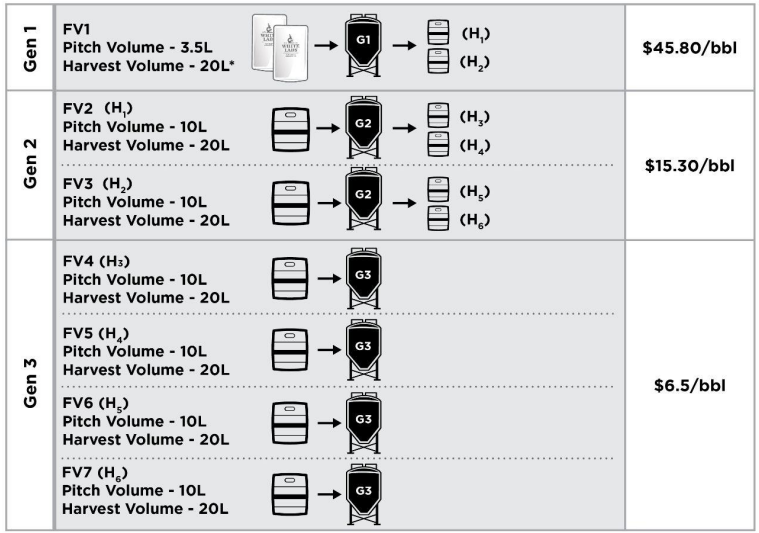
STATS

Brewhouse Size	10bbl
FV Size	10bbl
OG	15P
Pitch Volume	3.5L
Cost	$458
Yield	198 pints/bbl (80% yield)

*Estimate= 5-6x cell growth
*Repitch Rate = 1 Liter per 1 bbl

WHITE LABS
PURE YEAST & FERMENTATION

MAXIMIZE EFFICIENCY BY SPLITTING GENERATIONS



In this example, a 10bbl fermentation produces 20L of harvested yeast slurry.

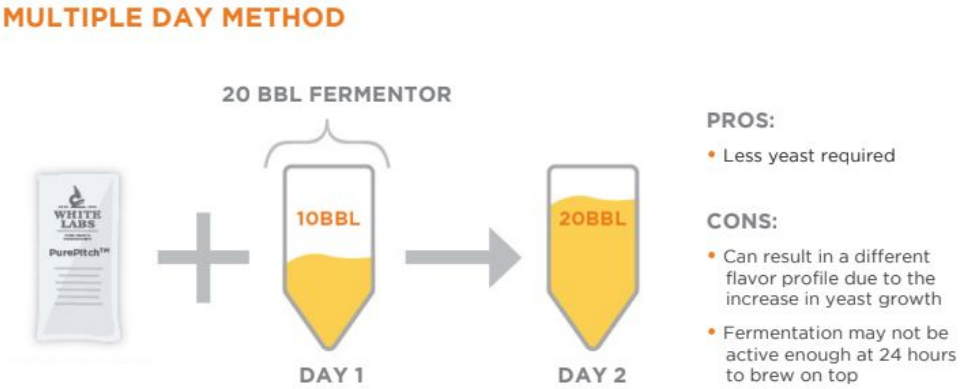
The volume of yeast needed to hit the target pitching rate in the next batch is only 10L.

Production costs are reduced by splitting the culture into two new batches.

Double Batching

General Rules:

- Avoid oxygenation after 24hrs
- Ensure yeast is active
- Don’t start with too much yeast
- Keep it warm



Method 3: Double Batching

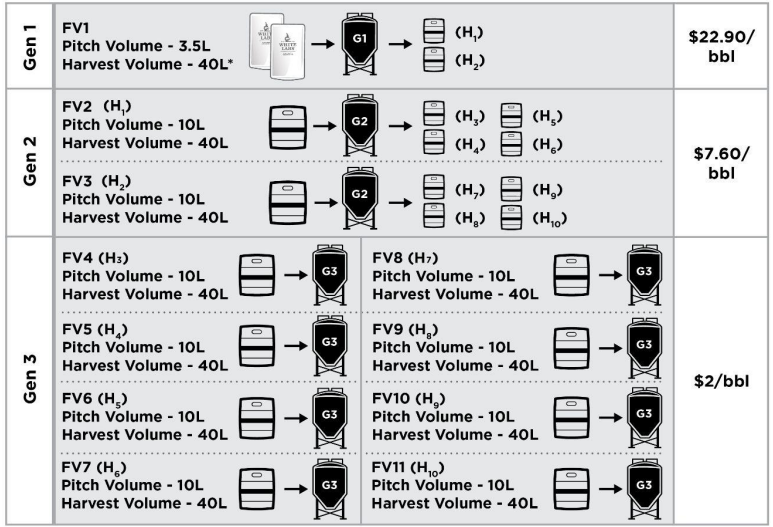
STATS

Brewhouse Size	10bbl
FV Size	20bbl
OG	15P
Pitch Volume	3.5L
Cost	$458
Yield	198 pints/bbl (80% yield)

*Estimate= 10-12x cell growth
*Repitch Rate = 1 Liter per 1 bbl

WHITE LABS
PURE YEAST & FERMENTATION

COST SAVINGS OF DOUBLE BATCHING



- The double batching strategy provides the greatest cost efficiency
- Brew Wort Run 1 (WR_1) -> Pitch yeast for WR_1 volume -> Brew WR_2 -> Harvest x2
- This method requires FV to be twice the volume of the brewhouse
- Cost savings dependent on available tank space and brewhouse schedule

Method 4: Warm-Pitch Lagers

WHITE LABS
PURE YEAST & FERMENTATION

WARM PITCH METHOD
ALTERING LAGER FERMENTATION PROFILES BY PITCHING WARMER

- Start fermentation between 15-18°C (60-65°F)
- Maintain temperature until signs of fermentation are evident, typically within first 12-24hrs (CO_2 production or pH decrease)
- Once fermentation is active, lower temperature to 8-12°C over 24-48hrs (48-55°F)
- Once within 1P of terminal, free rise to 18°C (65°F) until diacetyl rest is complete (about 2-3 days)
- Cool 2-3°C (4-5°F) per day until hitting lager temperature of 2°C (35°F)

Method 4: Warm Pitch & High Pressure Lagers

STATS

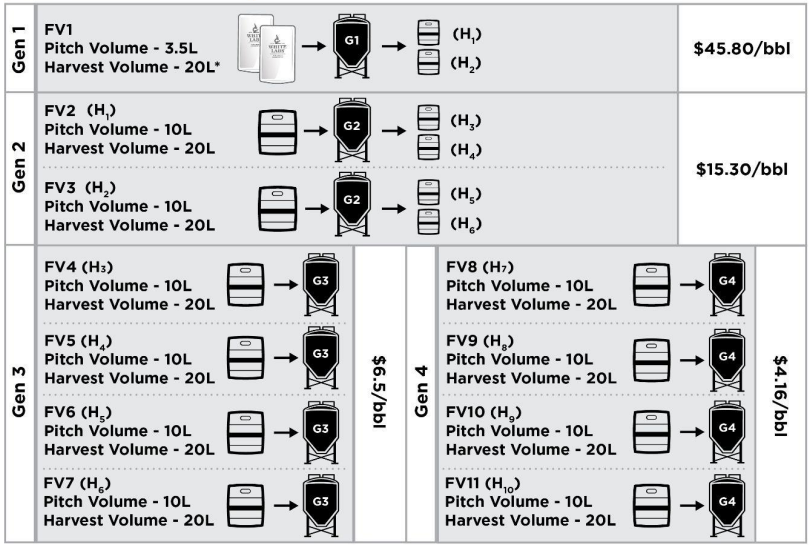
Brewhouse Size	10bbl
FV Size	10bbl
OG	12P
Pitch Volume	3.5L
Pitch Temperature	62°F
Cost	$458
Yield	198 pints/bbl (80% yield)

*Estimate= 5-6x cell growth
*Repitch Rate = 1 Liter per 1 bbl

WHITE LABS
PURE YEAST & FERMENTATION

WARM PITCH METHOD

ALTERING LAGER FERMENTATION PROFILES BY PITCHING WARMER



- The warm-pitch method is the best cost savings strategy for lager fermentations
- Promote yeast growth in the initial phases of fermentation requiring less yeast upon pitching
- Increase fermentation timelines and reduce tank residency while still maintaining a clean, crisp lager profile

Should I Propagate?

Checklist

- ❑ Sufficient dedicated clean space
- ❑ Capability to produce low-gravity, nutrient-rich media (can be wort)
- ❑ Time and proper scheduling
- ❑ Knowledgeable and well-trained staff in yeast culturing
- ❑ Ability to maintain sterility throughout entire process

**more critical than with beer fermentation*

Target Cost

How do I Quantify Yeast?

Target Cost: $10/bbl

FV Volume	Volume to Target Cost
1 bbl	6.5 bbl
5 bbl	25 bbl
10 bbl	46 bbl
15 bbl	70 bbl
20 bbl	90 bbl
30 bbl	170 bbl
60 bbl	330 bbl

Action Items

1. Quantify the cost of yeast in your brewery (Annual, Per Batch, Per Barrel)
2. Create plan for cost reduction, outline implementation
3. Collect and document simple data point like gravity and pH to create brewery standards for health
4. Dial in repitching rates to maximize generations
5. Track progress

Conclusion

- Harvesting and reusing yeast does not require expensive equipment or extensive training
    - Only need SOP, Documentation, Storage Vessel
- Harvesting and reusing yeast is the best way to maintain quality and save money
- Multi-generational use of high quality cultures leads to cost savings

13mL/bbl

Zinc Cost (1L) : $0.36/bbl

15ml/bbl

Brewzyme (1L) : $1.14/bbl

Brewzyme (10L) : $1.07/bbl

2-8g/bbl

ALDC (1kg) : $0.48/bbl - $1.92/bbl

ALDC (10kg) : $0.23/bbl - $0.90/bbl

Thank You!

e: jhoover@whitelabs.com