

The background features abstract green geometric shapes. On the left, a solid green triangle points downwards. On the right, a complex arrangement of overlapping translucent green triangles and polygons creates a layered, architectural effect. A thin, light grey line extends from the bottom left towards the right side of the composition.

Critique My Technique

Julian Borrill

Brewing goals

- ▶ Make good beer in a variety of styles
- ▶ Make multiple batches simultaneously
 - ▶ Event brewing - social & work
- ▶ Accommodate my travel schedule
- ▶ Conserve water
- ▶ Don't throw out my back
- ▶ Stay within a reasonable budget



Set-up



- Garage Mahal brewery



- Basement: fermentation, tap-room & storage

Recipes

BAM Barrel Biere de Garde

Created Sunday September 6th 2020

**btbni**

Original Gravity:	Final Gravity:	ABV (standard):	IBU (tinseth):	SRM (morey):	Mash pH	Cost \$
1.066	1.013	6.99%	23.06	12.69	5.38	n/a

Fermentables

Amount	Fermentable	Cost	PPG	°L	Bill %
10 lb	American - Pilsner		37	1.8	70.2%
1 lb	Munich - Light 10L		33	10	7%
1 lb	American - Vienna		35	4	7%
8 oz	Belgian - CaraVienne		34	20	3.5%
8 oz	American - Victory		34	28	3.5%
4 oz	American - Caramel / Crystal 80L		33	80	1.8%
16 oz	Belgian Candi Sugar - Amber/Brown (60L) - <i>(late addition)</i>		38	60	7%

14.25 lb / \$ 0.00

Hops

Amount	Variety	Cost	Type	AA	Use	Time	IBU	Bill %
0.50 oz	Northern Brewer		Pellet	8.5	Boil	60 min	13.28	20%
1 oz	Fuggles		Pellet	4.5	Boil	15 min	6.98	40%
1 oz	Fuggles		Pellet	4.5	Boil	5 min	2.8	40%

2.5 oz / \$ 0.00

Mash Guidelines

Amount	Description	Type	Temp	Time
8.6 gal		Infusion	152 °F	60 min

Other Ingredients

Amount	Name	Cost	Type	Use	Time
1 each	Campden Tablet / 32 Each		Water Agt	Mash	1 hr.
2.50 g	Baking Soda		Water Agt	Mash	1 hr.
4 g	Calcium Chloride (dihydrate)		Water Agt	Mash	1 hr.
4.50 g	Gypsum / 100 Grams		Water Agt	Mash	1 hr.
4 ml	Phosphoric acid / 487 Milliliters		Water Agt	Mash	1 hr.
1 each	Whirlfloc		Fining	Mash	10 min.

Yeast

White Labs - Belgian Bastogne Ale Yeast WLP510

Amount: 1 Each **Cost:** **Attenuation (avg):** 77% **Flocculation:** Medium

Optimum Temp: 66 - 72 °F Starter: No

Fermentation Temp: - **Pitch Rate:** 0.5 (*M cells / ml / ° P*) 183 B cells required

Priming

CO₂ Level: 2.45 Volumes

Target Water Profile Balanced Profile

Ca⁺² 9 Mg⁺² 3 Na⁺ 11 Cl⁻ 6 SO₄⁻² 9 HCO₃⁻ 34

1499

Created Sunday September 6th 2020

**btbni**

Original Gravity:	Final Gravity:	ABV (standard):	IBU (tinseth):	SRM (morey):	Mash pH	Cost \$
1.046	1.009	4.86%	64.1	3.89	5.34	n/a

Fermentables

Amount	Fermentable	Cost	PPG	°L	Bill %
16 lb	American - Pale 2-Row		37	1.8	84.2%
2 lb	American - Carapils (Dextrine Malt)		33	1.8	10.5%
1 lb	American - Caramel / Crystal 10L		35	10	5.3%

19 lb / \$ 0.00

Hops

Amount	Variety	Cost	Type	AA	Use	Time	IBU	Bill %
1 oz	Magnum		Pellet	13.3	First Wort	60 min	28.55	5.9%
2 oz	Cascade		Pellet	7.2	Boil	30 min	21.6	11.8%
2 oz	Cascade		Pellet	7.2	Boil	15 min	13.95	11.8%
4 oz	Cascade		Pellet	7.2	Aroma	0 min		23.5%
4 oz	Amarillo		Pellet	8.6	Dry Hop	Day 5		23.5%
4 oz	Simcoe		Pellet	11.9	Dry Hop	Day 5		23.5%

17 oz / \$ 0.00

Mash Guidelines

Amount	Description	Type	Temp	Time
14.16 gal		Infusion	150 °F	60 min

Other Ingredients

Amount	Name	Cost	Type	Use	Time
1 each	Campden Tablet		Water Agt	Mash	1 hr.
4.50 g	Calcium Chloride (dihydrate)		Water Agt	Mash	1 hr.
12 g	Gypsum		Water Agt	Mash	1 hr.
4 ml	Phosphoric acid / 487 Milliliters		Water Agt	Mash	1 hr.
1 each	Whirlfloc		Water Agt	Boil	10 min.

Yeast

GigaYeast - NorCal Ale #1

Amount: 1 Each **Cost:** **Attenuation (custom):** 78% **Flocculation:** Medium

Optimum Temp: 64 - 77 °F

Fermentation Temp: 65 °F **Pitch Rate:** 0.75 (*M cells / ml / ° P*) 341 B cells required

Priming

CO₂ Level: 4.04 Volumes

Target Water Profile Light colored and hoppy

$$\text{Ca}^{+2} \ 75 \qquad \text{Mg}^{+2} \ 5 \qquad \text{Na}^{+} \ 10 \qquad \text{Cl}^{-} \ 50 \qquad \text{SO}_4^{-2} \ 150 \qquad \text{HCO}_3^{-} \ 0$$

Milling the grains

- ▶ BIAB hoist + fishing scale + 5G bucket
 - ▶ 5G ~ 25lb
- ▶ Monster Mill MM2 with hopper extension
- ▶ Harbor Freight heavy duty low speed drill
- ▶ 5 years, 120 batches, ~2100 lb grain milled
 - ▶ Set-screw heads sheared off
 - ▶ Rollers now often skip
 - ▶ Hand-crank till it catches
 - ▶ Moistening grains helps
 - ▶ Mill the night before brewing



Preparing the mash water

- ▶ Fill both kettles with each batch's total required water using RV hose from tap & fire up both burners
- ▶ Add
 - ▶ Campden tablet for chloramine
 - ▶ Salts for style
 - ▶ Almost always CaCl , CaSO_4
 - ▶ Occasionally MgSO_4 , NaHCO_3
 - ▶ 85% H_3PO_4 for pH
- ▶ Take temperature of grain & calculate pre-mash temperature



Mashing the grains

- ▶ Record actual pre-mash temperature
- ▶ Mash in grains
- ▶ Record mash temperature
- ▶ Insulate
 - ▶ 15G: sleeping bag
 - ▶ 20G: reflective insulation roll/tile + velcro
- ▶ Batches now staggered by ~20 minutes



Bringing to the boil

- ▶ Unseal mash & record temperature
 - ▶ Typically 1-2F loss
- ▶ Stir & lift/roll immersed bag to rinse
- ▶ Hoist bag to drain over kettle
- ▶ Quick-check gravity
- ▶ Fire up burner & add any first wort hops
- ▶ One bag is drained, record pre-boil gravity, volume & efficiency
 - ▶ BdG: 78%
 - ▶ 1499: 70%



The boil

- ▶ Batches now staggered by ~40 minutes
- ▶ Calculate clock times for all additions, across both batches.
- ▶ At each addition, set timer & prep next



BAM Barrel Biere de Garde
Created Sunday September 6th 2020

Original Gravity: 1.069 Final Gravity: 1.014 ABV (standard): 7.18% IBU (tinseth): 22.37 SRM (morey): 11.35

Amount	Fermentable	Cost	%
10 lb	American - Pilsner	37	1.8
1 lb	Munich - Light 10L	33	10
1 lb	American - Vienna	35	4
oz	Belgian - CaraVienne	34	7.3%
oz	American - Victory	34	8%
oz	American - Caramel / Crystal 80L	33	1.8%
oz	Belgian Candi Sugar - Amber/Brown (80L) - (late addition)	38	60

lb / \$ 0.00

Variety	Cost	Type	AA	Use	Time	IBU	Bill %
Northern Brewer		Pellet	7.8	Boil	60 min	12.41	20%
Fuggles		Pellet	4.5	Boil	15 min	7.11	40%
Fuggles		Pellet	4.5	Boil	5 min	2.85	40%

Guidelines: Grain 60% Premium 1.5% f

Description	Type	Temp	Time
	Infusion	152 °F	60 min

Ingredients: 1.040
153 @ 9:30 → 154 @ 10:40 86@151

Name	Cost	Type	Use	Time
Campan Tablet / 32 Each		Water Agt	Mash	1 hr.

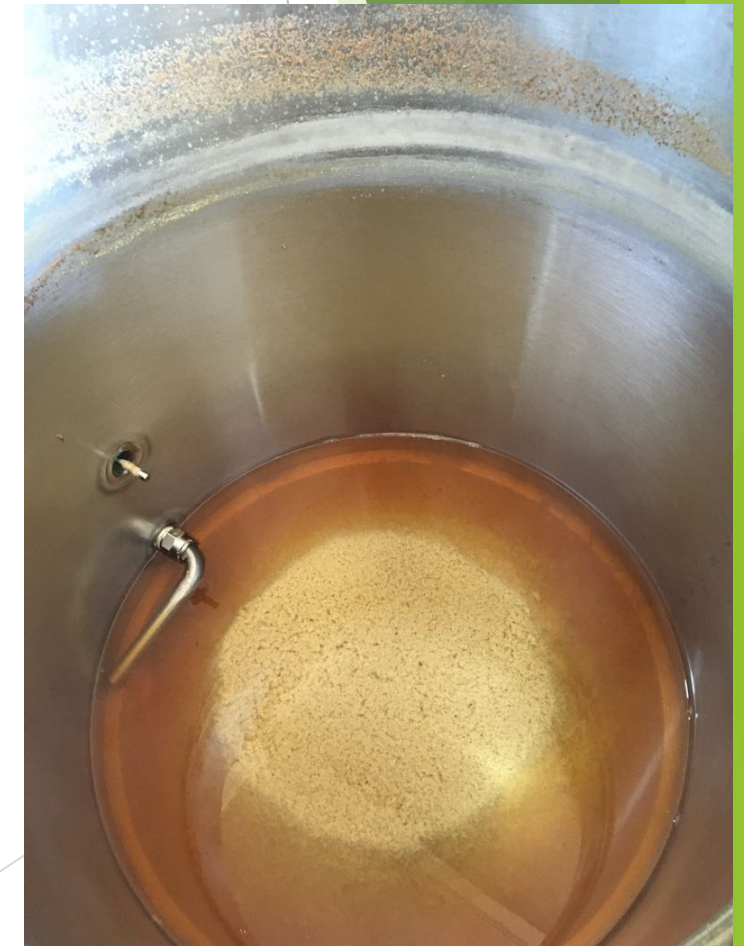
Flame-out

- ▶ Add 0 minute hops & kill flame
- ▶ Record final gravity
- ▶ Hang hop spider from hoist to drain
- ▶ Record final volume
- ▶ Start whirlpool with mash paddle & leave to settle
- ▶ Cross-check efficiency
 - ▶ BdG: 77%
 - ▶ 1499: 72%



No-chill

- ▶ Rinse sterile 6G HDPE no-chill containers with Star San
- ▶ Drain wort, leaving whirlpooled trub mound
- ▶ *Don't turn your back on the first half of the 10G batch!*
- ▶ Seal HDPE container, move to basement, invert & leave overnight



Clean-up

- ▶ Salvaging the utility sink from the kitchen remodel and plumbing it in outside with hot water and a spray/stream hose was a game-changer
- ▶ 2nd sink also stores cleaning supplies - PBW, Star San, scrubbers
- ▶ End by filling kettles with 1st generation PBW solution to soak



Break



BD+1: Pitch yeast

- ▶ Breweries shut on Mondays so no yeast for 1499
 - ▶ No-chill can wait almost indefinitely
- ▶ Rinse fermenter with Star San, pour in BdG
- ▶ Pitch WLP510 (Belgian Bastogne)
- ▶ 60s O₂ @ ¼ psi
- ▶ Set fermentation chamber temperature control to 66-68F
- ▶ Start dehumidifier
- ▶ Rinse no-chill container & fill with 2nd generation PBW solution from kettle.



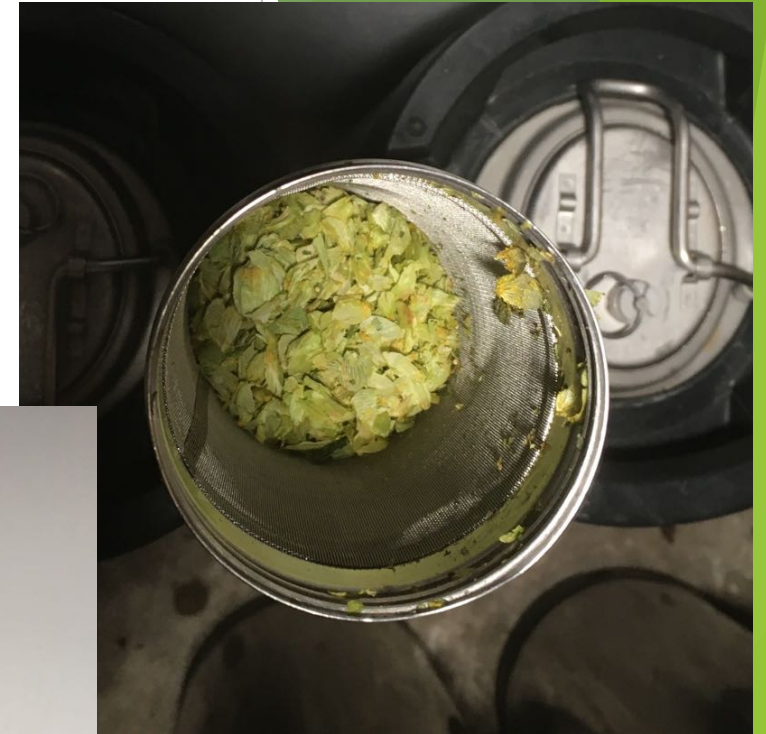
BD+2

- ▶ Pick up a keg of Penske Pale and an Erlenmeyer flask of fresh yeast from Faction
 - ▶ Pulled from a batch dry-hopped with strata, mosaic & simcoe
- ▶ Also previously used Alameda Island, Drakes & Ghost Town
- ▶ Pitched as before, except
 - ▶ Massive overpitch
 - ▶ 30s O₂ @1/4 psi
 - ▶ Lower temperature range to 64-66F.



BD+7: Sample/Dry Hop

- ▶ BdG: 1.013 & 80% attenuation
- ▶ 1499: 1.007 & 85% attenuation
- ▶ Dry hop 1499
 - ▶ Batch 1: 2oz each Amarillo & Simcoe pellets added loose
 - ▶ Batch 2: 5oz Faction SAPA mix leaf added in dry-hopper



BD+12: Cold-crash

- ▶ Replace airlocks with tapped caps
 - ▶ Previously fixed balloons of CO₂ to the taps; now just seal.
- ▶ Drop temperature to 37-39F for 4 days
 - ▶ Had to shorten for this schedule



BD+15: Kegging & carbing

- ▶ Siphon into purged keg through out valve
 - ▶ Some exposure to air through open fermentor top; purge keg after filling
- ▶ Force-carb at 30 PSI for 36 hours in cold fermentation chamber
- ▶ Clean fermenters and fill with 3rd generation PBW from no-chill containers (+ top-off)
- ▶ Rinse no-chill containers with Star San & store
- ▶ Soak fermenters for ~1 day, rinse with Star San & store



BD+17: Drink!



Event Brewing

- ▶ Jockey box with 75' stainless coils, keg jackets & 5lb CO₂ tank
- ▶ Well-tested 4-tap spread:
 - ▶ IPA
 - ▶ Pale Ale
 - ▶ Something malty
 - ▶ Something blond
 - ▶ Star San
- ▶ Single keg or 1G uKeg for parties



Brewing goals

- ▶ **Make good beer in a variety of styles**
 - ▶ Progressively added all-grain + temperature-controlled fermentation + fresh brewery yeast
 - ▶ ... but I feel like I've plateaued
- ▶ **Make multiple batches simultaneously**
 - ▶ Dual-burner/dual-kettle BIAB allows 2-3 batches and 5-20G per brew-day
- ▶ **Accommodate my travel schedule**
 - ▶ Online software with recipes, inventory & calculators
 - ▶ Temperature-controlled fermentation in oversized fermenters

Brewing goals

- ▶ **Conserve water**
 - ▶ No-chill + PBW solution cycle + keg of Star San from purging
 - ▶ Consistently in the 99th percentile of EBMUD users
- ▶ **Don't throw out my back**
 - ▶ Bag hoist
 - ▶ Outdoor sink
 - ▶ Maybe move to smaller containers in time
- ▶ **Stay within a reasonable budget**
 - ▶ Define “reasonable” ...