

# Project Overview

**Project Type:** Lemonade Production Facility – Batch-based, Craft Operation  
**Location:** Asheville, North Carolina  
**Production Capacity:** 500 bottles/day (12 oz each)  
**Operating Days:** 6 days/week  
**Target Shelf Life:** 7 days (requires cold chain)  
**Product Type:** Small-batch, preservative-free specialty lemonade (e.g., basil-lime, ginger-mint, lavender-honey)  
**Packaging:** Recyclable glass bottles

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## Site Conditions

**Climate:** Humid Subtropical  
**Water Source:** Municipal – filtered  
**Electrical Access:** 240V single-phase and 3-phase available  
**Zoning:** Light industrial, food manufacturing approved  
**Flooring:** Reinforced concrete (suitable for wet processing areas)  
**Drainage:** Sloped with trench drains

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## Equipment Details

Equipment	Description	Capacity/Specs	Unit Cost
Fruit Washer	Automated rotating drum washer	250 lbs/hr	\$6,000
Cold Press Juicer	Hydraulic press for raw juice	30 gallons/hr	\$18,000
Mixing Tank (Stainless)	For blending juice with flavors/syrups	100 gallons, jacketed	\$12,000
Bottle Rinser & Filler	4-nozzle filler, semi-automatic	400 bottles/hr	\$9,000
Bottle Capper	Pneumatic capper	500 bottles/hr	\$4,000
Label Applicator	Manual-assisted, roll-feed	600 bottles/hr	\$2,500

Cold Storage	Walk-in cooler, 6'×8'	1,200 bottles	\$10,000
Cleaning-in-Place (CIP) Kit	Circulation pump, sanitizing reservoir	20 gallons/min	\$2,000

**Total Equipment Cost: \$63,500**

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## Process Flow

1. **Raw Material Intake** – Lemons, herbs, sugar/syrups delivered fresh daily
  2. **Washing & Sorting** – Clean produce using drum washer
  3. **Juicing** – Cold-press to preserve nutrients
  4. **Flavor Infusion** – Herbs or spices added to mixing tank
  5. **Bottling** – Glass bottles rinsed, filled, and capped
  6. **Labeling & Batch Coding** – Brand + date labels applied
  7. **Cold Storage** – Inventory stored for distribution within 48 hours
  8. **Sanitization** – CIP used at day-end to clean all food-contact surfaces
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## Cost Rules & Assumptions

### Explicit Rules:

- Equipment operating cost  $\approx$  10% of its purchase value annually
- Bottling line (filler + capper + labeler) capacity limited to **400 bottles/hr**, which is the system bottleneck
- Cold press must run at least **2 hours/day** to meet production targets

- Walk-in cooler must maintain **<40°F** for safety
- Utilities (electricity + water) assumed at \$0.07/bottle

#### Implicit Rules:

- If scaling to 1000 bottles/day, must double bottling line OR add shift
- Maximum practical juicing time/day = 6 hours due to operator fatigue
- Weekly downtime = 1 day for deep cleaning and maintenance
- 15% overhead added to base cost to account for unlisted minor items (hoses, clamps, racks, safety gear)



## Utility & Install Cost Estimates

Item	Description	Estimated Cost
Plumbing & Drainage	Food-grade piping, floor drains	\$5,000
Electrical Panel Upgrade	For juicer, cooler, and motor loads	\$7,000
HVAC & Cold Chain Infrastructure	Ventilation, cooler installation	\$8,500
Equipment Rigging & Placement	Delivery, setup, anchoring	\$3,500
Workstations & Wash Basins	Stainless prep tables, hand-wash stations	\$2,000
Inspection & Certification	Health dept. approval, food safety certs	\$1,500

**Utilities & Install Subtotal: \$27,500**

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## Building Fit-Out (Optional Improvements)

- Paint, signage, lighting: **\$4,000**
  - Light renovations (partition walls): **\$6,000**
  - Contingency (10% of TIC): **\$9,100**
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## Total Installed Cost (TIC) Summary

Category	Cost
Equipment	\$63,500
Utilities & Install	\$27,500
Building Fit-Out	\$10,000
Contingency (10%)	\$9,100

 **Total Installed Cost (TIC): \$110,100**

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## Risks & Optionality Levers

### Key Sensitivities:

- 🍊 Citrus pricing fluctuations may affect raw material availability
- 📦 Glass bottle supply chain needs backup vendor (import delays possible)
- ⚡ Utility rates may rise, pushing per-bottle cost above \$0.10
- 🚰 Sanitation violations could halt operations temporarily
- ❄️ Cold storage reliability is critical — consider backup generator

### Optionality Levers for Cost/Capacity:

- Use plastic bottles to reduce per-unit cost by \$0.08

- Upgrade to automatic labeler to save 1 labor hour/day (~\$3,500)
  - Move to 2 shifts for higher throughput without full re-capitalization
  - Partner with a nearby cold-storage provider instead of owning cooler
  - Increase product shelf-life (e.g., flash pasteurization) to expand delivery radius
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## Recommendations

- Proceed with baseline design as outlined for 500 bottles/day
  - Use modular equipment (press, filler) to ease future upgrades
  - Begin small, focus on quality and compliance
  - Consider batch tracking software if scaling to regional distribution
  - Reassess cold chain needs quarterly
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