Select Ingredients

Improvements In Hop Pellet Quality For The Small Brewery

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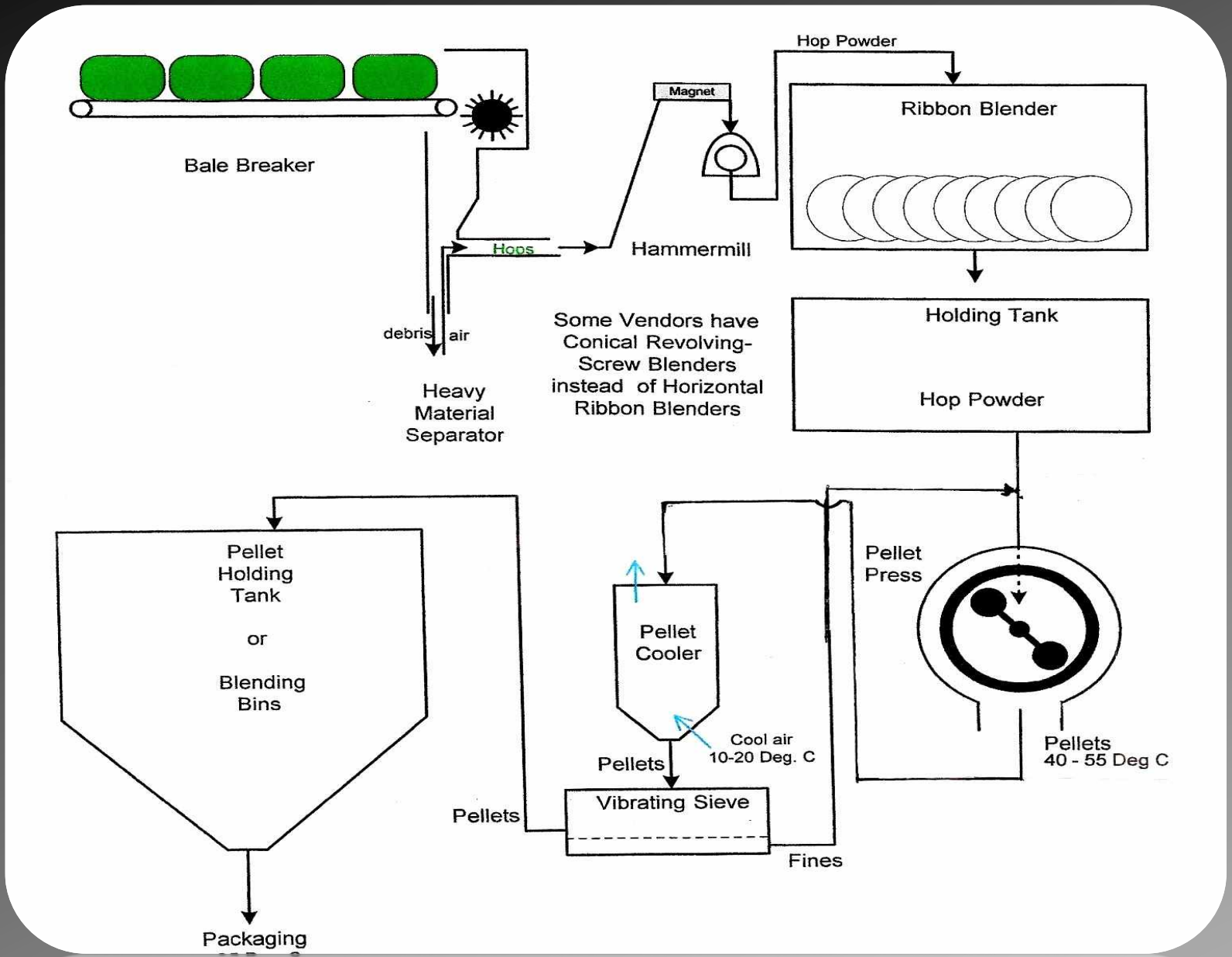
Types of Pellets

- T-90 Pellets
  - Most Common
  - T-90 is somewhat of a misnomer as typical efficiency or yield is 97%
  - Basically a hop cone minus some moisture
  - Similar utilization to whole cone in kettle
  - Reduces freight and storage costs vs whole leaf

Types of Pellets

- T-45 Pellets
  - Generally half the bulk yield of T-90
  - Conveyed through hammer mill at -22º F
  - Lupulin Glands become hard and glassy and separate from vegetable matter
  - Lupulin is concentrate is then mixed with non-lupulin material to hit alpha target.

Type 90 Processing



Pellet Density – Bulk vs Solid

- Bulk density tells you if your pellets will fit in your box
- Solid density measures the hardness of the actual pellet
- Why does proper density matter?

Bulk Density Method

- Fill a volumetric container with pellets
- Weigh the sample, multiply to get a 1 cubic foot equivalent
- Typical results are 38-41 pounds per cubic foot
- Problem
  - Air space between the pellets in the sample taken
  - This sample method does not correlate with how hard the pellets are

Solid Density Method

- Solid density only measure actual pellets
- Pellets are placed end to end in a cylinder with a known volume
- Based on the length of sample and pellet diameter you get the actual pellet volume of your sample
- Take the actual pellet volume, weigh the sample in grams and convert to equivalent at 1 cubic foot
- That is TRUE pellet density

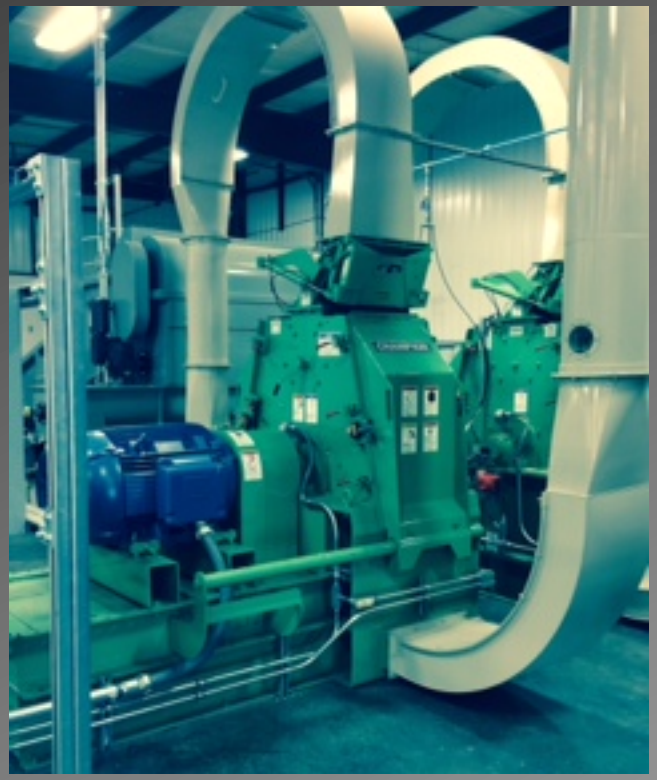
Proper Pellet Density

- Through simple water solubility tests 68-71 pounds per cubit foot SOLID density has the best reaction at room temperature or slightly colder fermentation tanks
  - Pellets with high solid density (>78 pounds per cubic foot) will sink to the bottom and may never fully dissolve
  - Pellets with low density (<65 pounds per cubic foot) will float on top, creating a cake on the surface
  - Pellets with proper density will be close to equal buoyancy and within a few minutes begin to dissolve and move through the fermentation tank.

Bale Breaker

- Breaks bales into small clumps
- Rock trap to remove heavy objects

Hammer Mill



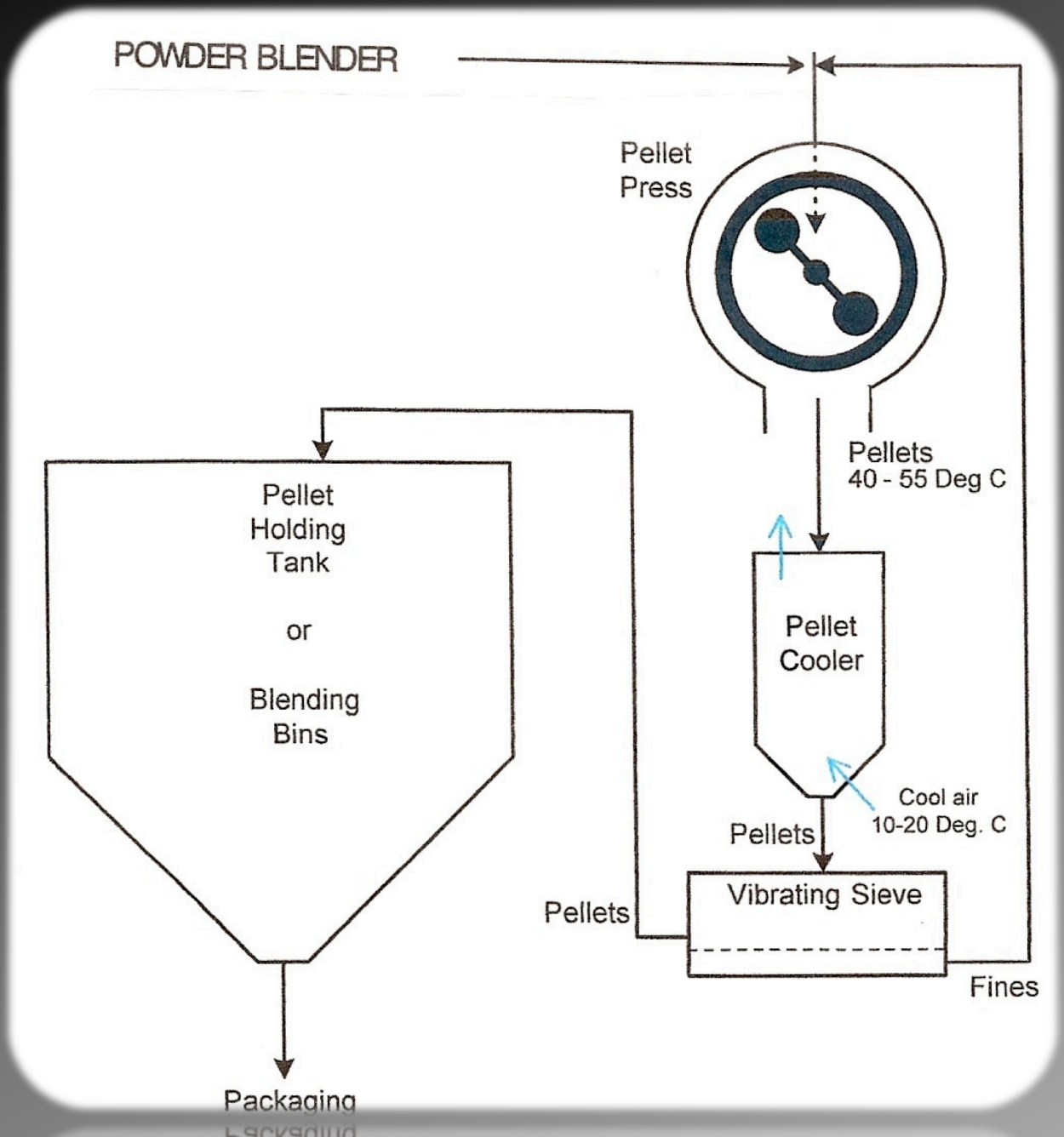
- Pulverizes hops into fine powder
- Magnet removes any metallic particles

Blending Tank

- Critical to pellet uniformity
- Bigger blender:
  - Better Uniformity
  - Continuous production
- These tanks hold 2,400 lbs each

Bag Housing

- State of the art filter systems to filter and recycle air
- Filter system returns hop particles to the pellet process immediately
- Explosion safety features

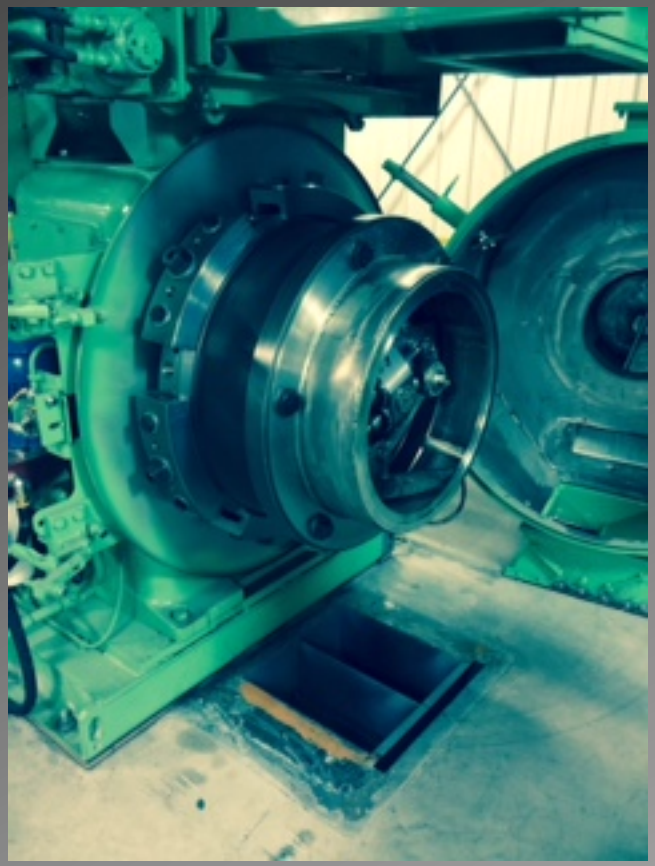

POWDER BLENDER
Pellet
Press
Pellets
40 - 55 Deg C
Pellet
Holding
Tank
or
Blending
Bins
Pellet
Cooler
Cool air
10-20 Deg. C
Pellets
Vibrating Sieve
Pellets
Fines
Packaging

The Pellet Process

- Compression heats up the powder & melts the natural hop resins. As the pellet cools these act as a glue to hold the pellet together
- Die diameter and geometry configuration are the best tools to regulate temperature. (<125°F)
- When the press starts up, the die is cold. More friction = glassy/streaky pellets
- All glassy pellets – up to 100 lbs – need to be discarded before heading to packaging

Type 90 Processing

- Compresses powder through a metal die hole to form a solid pellet
- Temperature control is important
- Adjustable parameters:
  - Die diameter
  - Feed rate
  - Hole geometry
  - Lineator roller clearance
- The ability to adjust the lineator roll while in process is new technology



Properly Made Pellets

- Green with no glassy or shiny surface
- Pellet should look rough; visually see pieces of vegetation
- Easily dissolve in the kettle or in fermenter

Monitoring Pellet Temperature

- Can be monitored with an IR temperature sensor or gun
- Probes measure continuous and real time temperatures throughout the pellet process
- Pellets should be quickly cooled with air in a pellet cooler

Mechanical Parameters in Pelleting

- 6mm (1/4 inch) is a fairly common diameter
- Density can be changed by adjusting the feed rate
  - Variety specific
  - Lineator roll adjustments required

Cooling Die With Liquid Nitrogen

- Used by processors to regulate pellet temperatures
- Very expensive and not always applied correctly
- Key is to have mechanical parameters set correctly
- Excessive use can frost burn pellets

Proper Cooling Is Important

- Warm pellets are sticky – especially high alpha varieties
- Pellets need to be cooled immediately following the die
- The longer the pellet is hot the more likely it is to lose aroma
- Warm pellets clump together like a brick
- Soft packaging is helpful to avoid hop bricks

Packaging

- Packed in a laminate foil to provide an oxygen barrier
- New technology as real time monitoring for residual oxygen
  - Specs are 2% at packaging
- Packaging 2 x 22lb foils in each “44 pound” box
  - Better ergonomically
  - Residual oxygen reduced compared to 1 x 44 pound foil
- Processor should be able to provide bag integrity report

Packaging

Hard Pack

- Oxygen vaccum from foil
- Pellets typically form a hard brick
- Need pick/hammer to break up
- Easy to see if compromised

Soft Pack

- Oxygen displacement by flushing with nitrogen
- Pellets loose
- Difficult to tell if foil compromised

Storage

- Store pellets at 31ºF – DRY
- Properly stored pellets are good for up to 5 years
- If foil is compromised in shipping quality will hold for approximately 2 weeks if stored at 31ºF

Storage

- Brewpubs and small breweries – invest in a chest freezer
- Larger breweries – dedicated hop walk in freezers or shipping containers
- Buy a bag sealer if not depleting the bag in 2 weeks once opened

Shipping

- Not a great deal of research has been dedicated to best shipping practices
- We know that heat has an adverse impact on hop quality[1]:
  - Decrease in alpha acids (iso-alpha acids formed)
  - Beta acids oxidized
  - Hard resin components increase in the presence of air
- In an inert atmosphere, low volatile components develop with high partial vapor pressure. A kind of “solvent smell” may result, especially at higher temperatures.[2]

1: EBC-Manual “Hops and Hop Products”; 2: What Happens To Hop Pellets During Unexpected Warm Phases, Dr.-Ing. Adrian Forster, Hopfenveredlung St. Johann

Shipping

- When shipping, particularly from Washington to California in summer, temperatures in storage and vehicles easily can exceed 77°F and adversely impact hop quality

- From Dr. Adrian Forster's research:
  - Max. temperature below 77°F: Good
  - Max. temperature 77 – 86°F: Acceptable at < 5 days
  - Max. temperature 86 – 95°F: Acceptable at < 2 days
  - Max. temperature 95 – 104°F: Dangerous
  - Max. temperature over 104°F: Unacceptable

What Happens To Hop Pellets During Unexpected Warm Phases, Dr.-Ing. Adrian Forster, Hopfenveredlung St. Johann

Shipping

- Solutions?
  - Refrigerated Freight
  - Taking the bulk of your hop contracts before the warm months
  - Avoidance of weekend transit times
  - Expedited Shipping

Thank you! Any Questions?