



**YAKIMA  
CHIEF  
- HOPS -**



**INNOVATION AND ADVANCED PRODUCTS**

BLAZE RUUD - DIRECTOR OF BREWING INNOVATION

## HOP ANATOMY



### Lupulin

Alpha Acids	2-20%
Beta Acids	2-20%
Hop Oils	0.5-4%
Lipids	1-5%

### Leaf / Bract

Polyphenols & Tannins	3-6%
Terpene-Glycosides	
Cellulose	40-50%
Proteins	15%
Water	8-11%



# PRODUCTS



## FRESH HOPS

Whole, Wet Hop Cones



## WHOLE LEAF HOPS

Whole, Kiln-Dried  
Hop Cones



## HOP PELLETS

T-90 Pellets &  
Pellet Blends



## CRYO HOPS®

Concentrated  
Lupulin Pellets



## AMERICAN NOBLE HOPS™

Hop Pellets



## CO<sub>2</sub> HOP EXTRACT

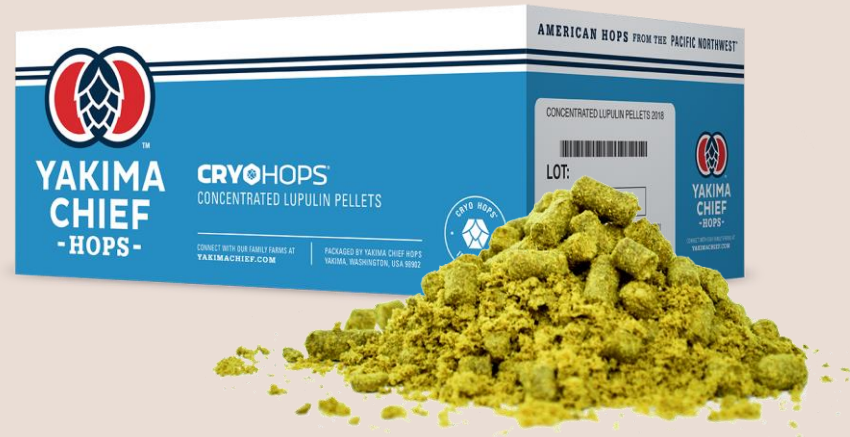


## ADVANCED PRODUCTS

IKE, Hop Oil

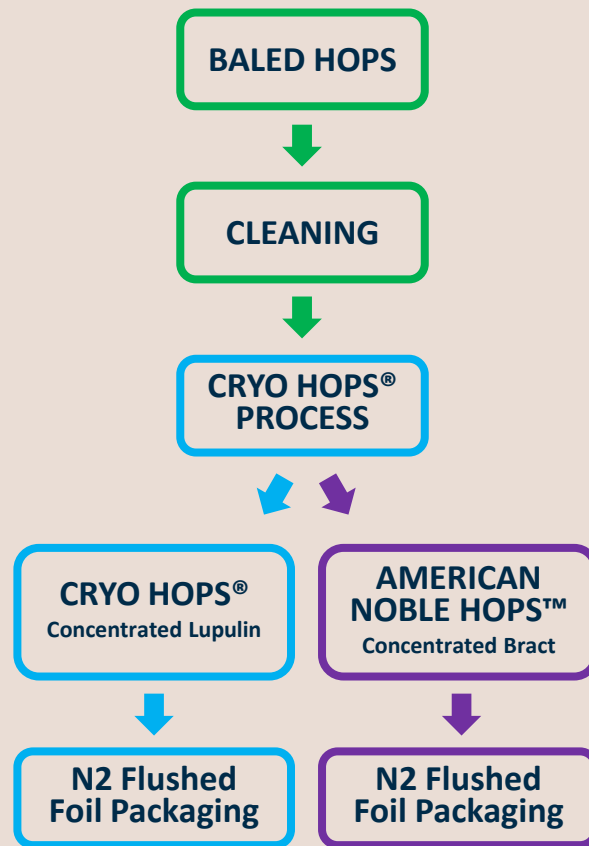
## CRYO HOPS®

- Cryo Hops® are the concentrated lupulin of the whole leaf hop cones containing resins and aromatic oils
- Lupulin is separated from whole leaf hop cones at extremely low temperatures in a nitrogen rich atmosphere, preventing oxidation
- Cryo Hops® is designed to provide intense hop flavor and aroma



## THE CRYO HOPS® PROCESS

- Whole leaf hops are cooled to subzero temperatures, shattered, and sifted
- Sifting is optimized to collect intact lupulin glands
- All steps occur near or below freezing in a nearly oxygen-free environment



## CRYO HOPS®

- Superior aroma through enhanced lupulin preservation. Less gland smear/rupture
- Reduced oxygen exposure
- Very fine-tuned temperature control
- Consistent and small particle size
- Increased yields
- ~1.8x Alpha Acid vs. Whole Leaf / T-90 Pellets
- ~2.2x Oil vs. Whole Leaf / T-90 Pellets

## CRYO HOPS® BENEFITS



### **INCREASED BREWERY YIELDS THROUGH REDUCED KETTLE TRUB**

Cryo Hops® reduces wort and beer loss after dry hopping by eliminating the sponge effect of spent leaf and pellet hops.



### **REDUCED VEGETAL & POLYPHENOL FLAVOR CONTRIBUTION**

The Cryo Hops® process selectively targets the important resins and oils contained within lupulin glands, leaving behind leafy plant matter and associated flavors, and concentrates the flavors and aromatics in the lupulin fraction (fruity, citrusy, tropical, piney, resinous).

## CO<sub>2</sub> HOP EXTRACT

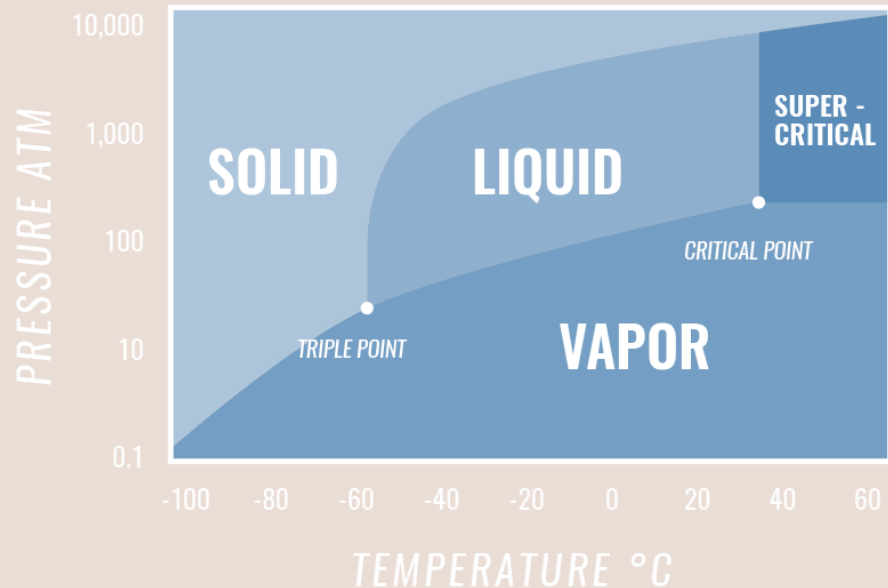
- Contains alpha acids, beta acids and hop oils
- Extraction process filters out solid particles while the CO<sub>2</sub> is recovered and reused
- Primarily used as a kettle ingredient to provide bitterness





## CO<sub>2</sub> HOP EXTRACT

- Hops pellets are infused with supercritical CO<sub>2</sub>
- Resins and oils are separated from the vegetal material and are in CO<sub>2</sub> solution until pressure is released, CO<sub>2</sub> is recaptured, and the resin/oil remain



## BENEFITS OF CO<sub>2</sub> HOP EXTRACT

- Extended shelf life and reduced storage requirements
- Increased alpha utilization
- Increased brew house yields through reduced kettle trub
- Reduced hot-side brew kettle foam formation during boil
- Bitterness, flavor, and aroma via late boil additions



## **BREWER'S PANEL – CRYO HOPS®**

**What are your experiences brewing with Cryo Hops®?**

- Flavor/Aroma Implications?
- Recipe Formulation?
- Yield Implications?
- Processing Efficiency? (Tank Time, VDK, etc.)

## **BREWER'S PANEL – CO<sub>2</sub> HOP EXTRACT**

### **What are your experiences brewing with CO<sub>2</sub> Extract?**

- Flavor/Aroma Implications?
- Recipe Formulation?
- Where Do You Use Extract?
- Dosing Methods?
- Yield Implications?
- Processing Efficiency?

## **DRY HOP METHODS**

### **When do you add them?**

- Active vs. Post Fermentation
- Do You Dump Yeast Prior to Addition?

### **Temperature?**

### **Contact Time?**