

Brewer Panel

2011 Winter Hops Conference
Trapp Family Lodge, Stowe, VT

What is the brewer looking for in hops?

- Hop Bitterness
- Hop Flavour
- Hop Aroma

How are these items applied in making beer?

It depends...

What kind of beer is the brewery making?

Calculation of Hop Addition Rate

Target: 30 IBU (mg/l)
Hops: 4% Alpha (α) Acid
Utilization: 25% (whole leaf) average

Addition Rate in α -acid

$$25 = \frac{30 \times 100}{x \text{ (mg } \alpha \text{/liter of wort)}}$$

$$x = \frac{30 \times 100}{25} = \mathbf{120 \text{ mg } \alpha \text{/liter wort}}$$

Addition Rate hops

$$\frac{100\text{g hops}}{4\text{g alpha}} = \frac{x \text{ g hops}}{0.120 \text{ g alpha}}$$

$$x = \frac{0.120 \times 100}{4} = 3 \text{ g hops/ liter wort}$$

$$= \mathbf{\underline{\underline{300\text{g/hl of 4\% Alpha Acid Whole Leaf Hops}}}}$$

On a 10 HectoLiter (1000L) system = 6.6 pounds of hops

Calculation of Hop Addition Rate

Target: 30 IBU (mg/l)
Hops: 4% Alpha (α) Acid
Utilization: 35% (pellets) average

Addition Rate in α -acid

$$35 = \frac{30 \times 100}{x \text{ (mg } \alpha \text{/liter of wort)}}$$

$$x = \frac{30 \times 100}{35} = \mathbf{86 \text{ mg } \alpha \text{/liter wort}}$$

Addition Rate hops

$$\frac{100 \text{ g hops}}{4 \text{ g alpha}} = \frac{x \text{ g hops}}{0.086 \text{ g alpha}}$$

$$x = \frac{0.086 \times 100}{4} = 2.15 \text{ g hops/ liter wort}$$

$$= \mathbf{\underline{215 \text{ g/hl of 4\% Alpha Acid Whole Leaf Hops}}}$$

On a 10 HectoLiter (1000L) system = 4.7 pounds of pellet hops

Utilization on the next level

- Whole Leaf hops: 20-30% Utilization
(using the Average 25% in the example)
- Pellet T-90: 30-40% Utilization
(using the Average 35% in the example)

Remember that not all brewing systems are equal.

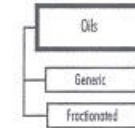
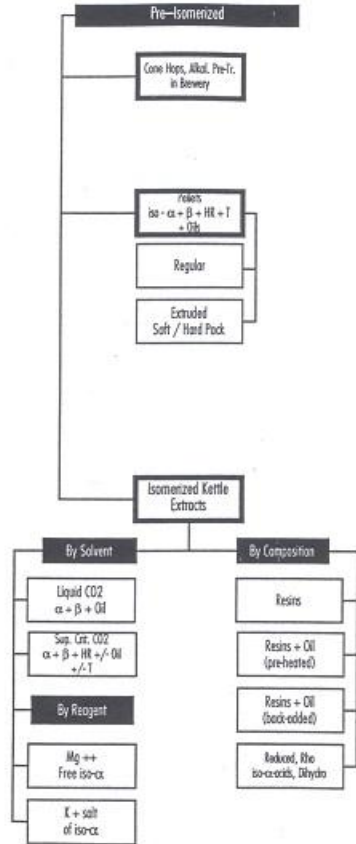
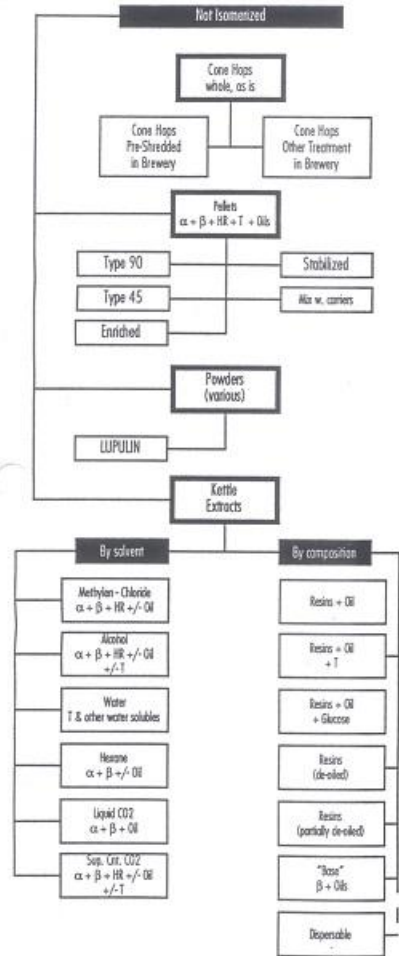
So Utilization varies from brewery to brewery.
Sometimes even from brewer to brewer...

Utilization on the next level

- Whole Leaf hops: 20-30% Utilization
- Pellet T-90: 30-40% Utilization
- Isomerized Pellets: 50-60% Utilization
- Kettle Extracts: 30-40% Utilization
- Isomerized Extracts: 80-90% Utilization

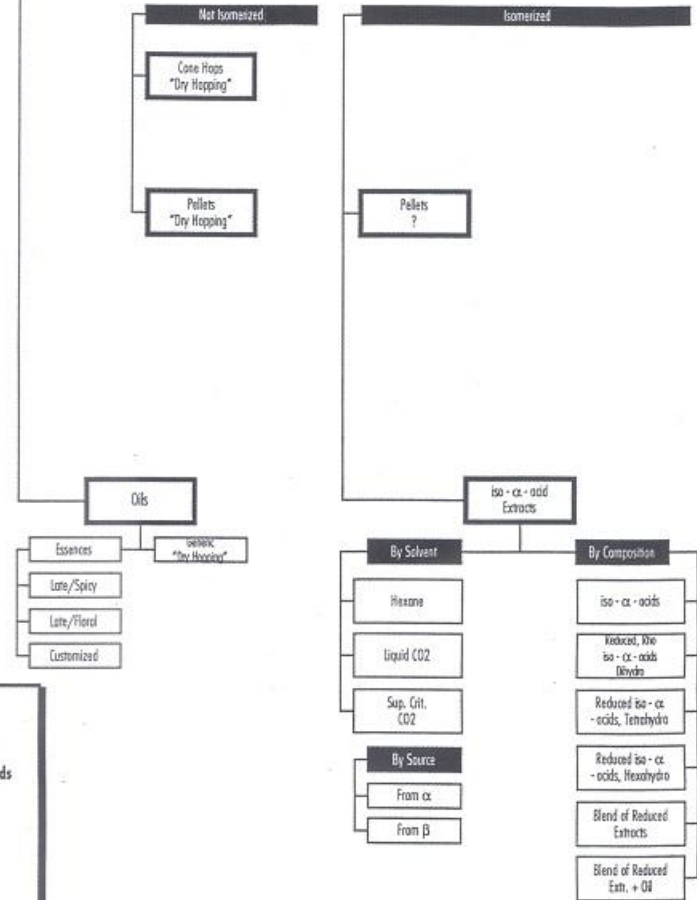
HOPS & HOP PRODUCTS PROCESSES FOR BITTERING & AROMATIZING OF BEER

Hot Hopping: KETTLE



α = Alpha acids
 β = Beta fraction
 iso - α = iso - alpha acids
 HR = Hard resins
 T = Tannin
 +/- = More or less

Cold Hopping: Post-Fermentation



Hop Storage Index

The method of determining of Hop Storage Index employs the American Society of Brewing Chemists spectrophotometric technique of hop analysis.

The HSI is defined as the ratio of absorbance at 275 nm to the absorbance at 325 nm of an alkaline methanolic solution of a non-polar extract of hops. It is often written as A_{275}/A_{325} .

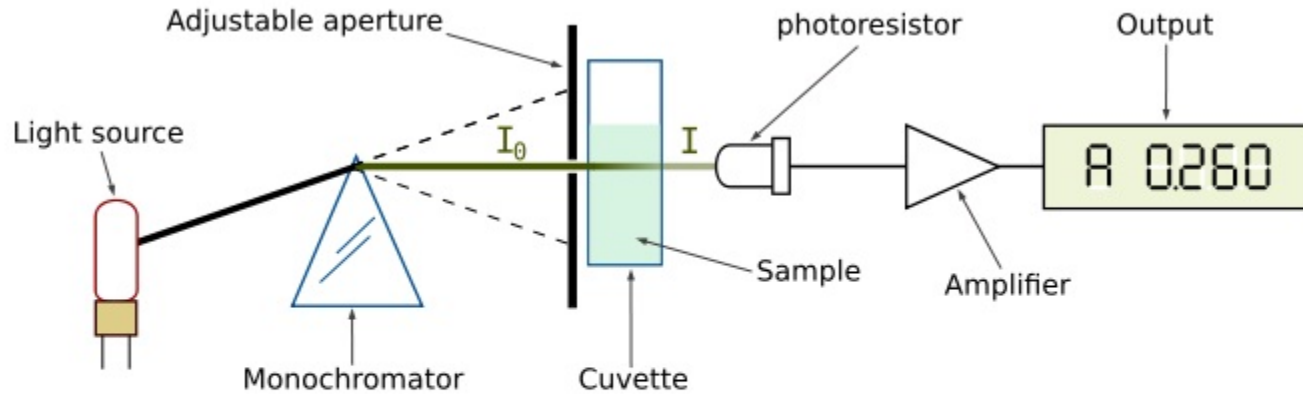
The absorption values of α - and β -acids extracts are maximal at 325 nm and minimal at 275 nm. Oxidised α - and β -acids extracts have maximum absorption at about 250-280 nm.

Oxidation of the hops is accompanied by a decrease in A_{325} and an increase in A_{275} , therefore the HSI ratio increases.

This ratio may be used to adjust the hopping rates for old hops that have lost up to 35% of their initial of α - and β -acids.



Single beam spectrophotometer



Hop Storage Index

Key points:

- Oxidation of the hops is accompanied by a decrease in A325 and an increase in A275, therefore the HSI ratio increases.
- This ratio may be used to adjust the hopping rates for old hops that have lost up to 35% of their initial of α - and β -acids .
- The HSI will increase with the three basic contributors: time, temperature and hop damage

Form	Utilization (BU in Beer x 100 / Alpha Acids in Hops)	Approximate Shipping & Storage Volume (Cubic Meters Per Hundred Thousand Hectoliters of Beer)	% Alpha Acids Lost in Cold Storage for One Year (as Yakima Clusters)
Baled Hops	15-30%	80 m ³	14%
Recompressed Hops	15-30%	42 m ³	15%
Regular Pellets	25-40%	24 m ³	5%
“Standardized” Pellets	25-40%	17 m ³	5%
Concentrated Pellets T-45	25-40%	14 m ³	5%
Standard Extract	25-40%	8 m ³	5%
Resin Extract	25-40%	3.5 m ³	3%
Purified Pre-Isomerized Extract	60-85%	3 m ³	3%

Cost is a major driving force in the use of products other than baled hops.

Beer produced from one cubic meter storage:

- Normal Baled Hops 1,000 hl
- Re-compressed Hops 2,000 hl
- Regular Pellets 3,500 hl
- Concentrated Pellets 7,000 hl
- Non-isomerized Extracts 7-21,000 hl
- Isomerized Extracts up to 60,000 hl