Hopsteiner

OPTIMIZATION OF (DRY-) HOPPING REGIMES

Brew Asia Tech Sessions 2024

BREW ASIA
TECHNICAL SESSIONS

www.hopsteiner.de

AGENDA

- Initial considerations
- Product overview
- Base beer
- Opportunities and risks of dry hopping
- Ways to control dry hopping

INITIAL CONSIDERATIONS

What are we planning to brew?

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What are we planning to brew?

- Beer style
  - Light Session Pale Ale – Strong double dry hopped hazy IPA
- Yeast
  - Attenuation, flavour profile, flocculation, biotransformation, thiol activity
- Malt bill
  - All malt, Cara malt involvement, unmalted grain, adjuncts
- Water
  - Total degree of hardness
  - Residual alcalinity
  - Chloride : sulfate ratio

PRODUCT OVERVIEW

The right product for the right job

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The right product for the right job

Conventional	Isomerized	Special
Leaf Hops • Cones • Vacupacks Pellets • Type 45 / 90 • Lupulinpellets	Kettle-Products • Iso-Pellets • IKE	Hop Oils • Type Dry (vs) • Type Noble (plus) • Type Essential AromaExtract Salvo™
Extracts • Total Resin Extract (EtOH) • CO_2-Extract • HopFlow	Downstream • Iso-Extract • Reduced Iso-Extracts	Light Stable Kettle Extract AlphaExtract XN / Polyphenol Products

BASE BEER

Bitterness and (Late)-Hop Aroma

BASE BEER

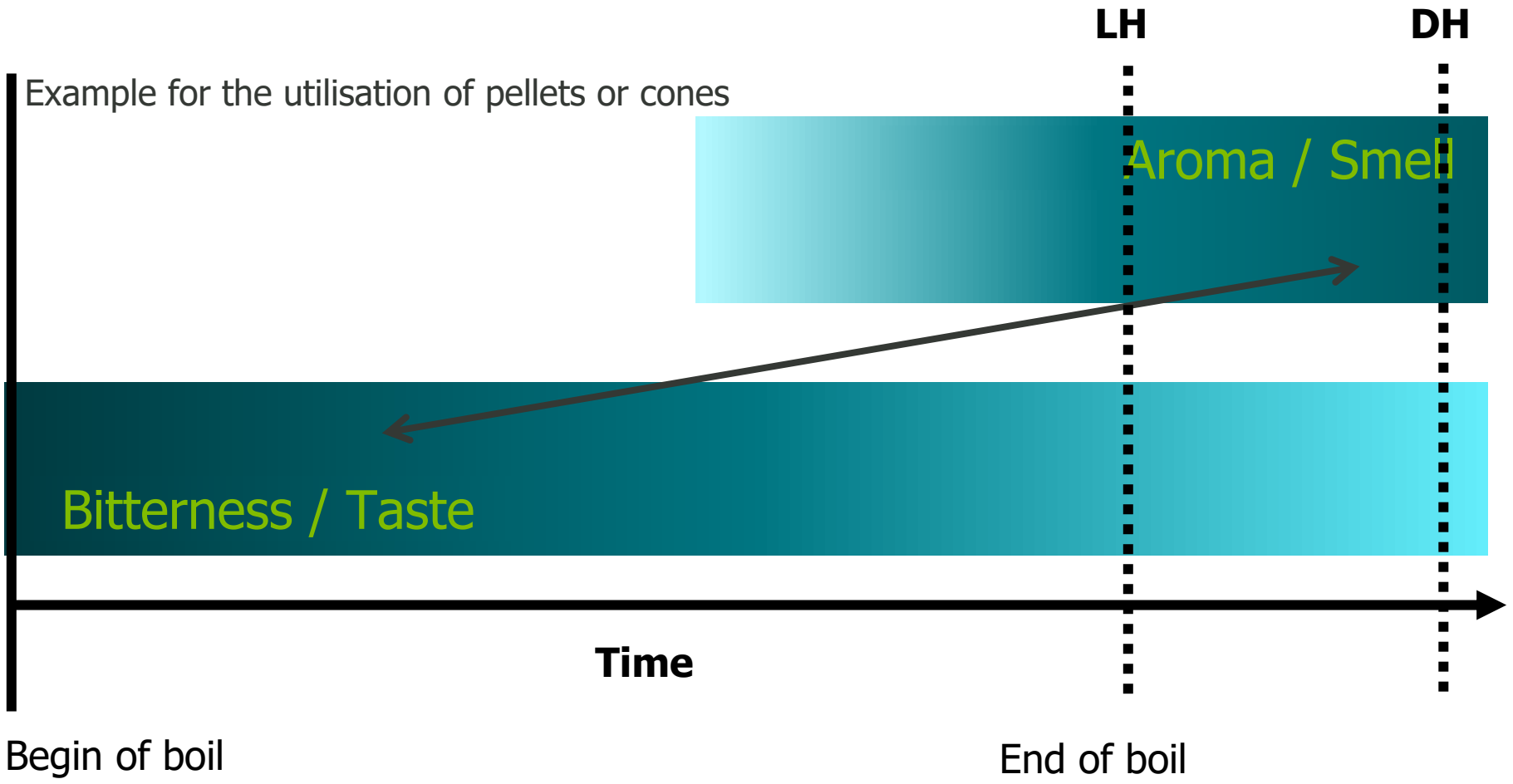
Isomerisation rates (indicational)

Boiling time [min.]	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0
Yield: Extract [%]	38	38	37	33	32	30	28	26	23	20	18	15	13	10	3
Yield: Pellets [%]	33	33	33	32	32	31	30	30	26	28	26	23	20	15	12

Whirlpool	Hot	Cooled down ~85°C
Yield: Pellets [%]	8-12	1,5-3

BASE BEER

Bitterness and late hop aroma



OPPORTUNITIES AND RISKS

... of dry hopping

OPPORTUNITIES OF DRY HOPPING

- Creating unique aroma and flavour profiles
- Keep a consistent quality
- Extending portfolio with relatively low effort
- Seasonal specialties

RISKS

… of dry hopping

- Hop Creep:
  - Hop derived enzymes -> saccharification of yet unfermentable extract
  - Vital yeast starts secondary fermentation
  - Increase/decrease: original gravity, alcohol, CO2, real extract
- Increase pH, potential microbiological problems
- Increased haze
- Beer losses: up to 30 % and above
- Oxidation
- Influence on the bitterness
- Hop burn burning, spicy sensation

CONTROLLING FACTORS

... of dry hopping

QUANTITY

CONTROLLING FACTORS

… of dry hopping

Quantity

- Depending on the beer style
  - 100-3000 g/hl (and above)
- Depending on variety
  - Total Hop oil contents ranging from 0.1- 4% (and above)
  - Greater impact of high-alpha varieties on beer bitterness
- Depending on the product
- Beer Matrix
  - Attenuation, alcohol, gravity, base bitterness…
- Capacity and geometry of the tanks

TIMING

CONTROLLING FACTORS

… of dry hopping

Timing

- **Early**, day 1-3 of fermentation
  - Hop creep during active main fermentation, no/low risk of secondary fermentation and subsequent side effects later in the process
  - Active fermentation supports biotransformation and release of Thiols
  - Reduction of grassy, resinous and herbal notes from highly volatile compounds
  - Emphasis on citrusy, fruity, floral notes
  - Low impact on haze
  - Low oxygen-impact, yeast can metabolize oxygen

CONTROLLING FACTORS

… of dry hopping

Timing

- **Maturation**
  - Similar effects as early, eventually less intense
  - Eventually prolonged maturation time
  - Greater impact on haze than early

CONTROLLING FACTORS

… of dry hopping

Timing

- **Late**, into final attenuated beer, often cold
  - Risk of hop creep if beer is not pasteurized/ sterile filtrated
  - Subsequent secondary fermentation in bottle/can/keg
  - Greater impact on haze
  - Emphasis on resinous, grassy aroma

PRODUCTS

CONTROLLING FACTORS

… of dry hopping

Products

- **Conventional – P45/90, Lupulin Pellets, Cones**
- Pros
  - Full spectrum of hop components
  - Classic dry hopping aroma
  - Traditional
- Cons
  - Risk of hop creep/secondary fermentation, etc.
  - Risk of oxidation
  - pH increase
  - Subsequent microbiological risk for high dosages
  - Beer losses

CONTROLLING FACTORS

… of dry hopping

Products

- **Hop oils**
- Pros
- No Hop creep
  - No impact on bitterness
  - No beer losses
  - Low risk of oxidation
  - Standardized (mostly) products, no/low annual fluctuations
  - Easy adjustments in finished beers
- Cons
  - Limited suitability for 100% application
  - Can´t replace pellets in existing brands 1 by 1

HANDLING/TECHNOLOGY

CONTROLLING FACTORS

… of dry hopping

Handling

- **Conventional Products**
- Awareness for oxidation
  - Flush hop vessel and pellets with CO_2
  - Flush tank with CO_2 during dry hop, „overflowing CO_2" to reduce O2 intake and grant homgeneity
  - Reseal opened hop bags and store below 4 °C to avoid oxidation and aroma loss.
- Flush from below with CO_2 to homogenize on the first days of contact
- Or circulate via pump, attention: yeast might be damaged, hop particle size reduced, might cause problems with fermentation/flocculation

CONTROLLING FACTORS

… of dry hopping

Handling

- **Hop oils**
- Automatic: in-line dosage with flow meter
- Manual:
  - Pre-solve oil in smaller vessel, e.G. 10- 20l NC keg
  - Flush keg thoroughly with CO_2
  - Partially fill with beer from tank
  - Add hop oil
  - Fill up with beer
  - Homogenize solution
  - Push/pump from keg into tank

CONTROLLING FACTORS

… of dry hopping

Technology

- **Dynamic dry hopping**
  - Various dry hopping systems, hop guns/torpedos, etc.
  - Most with hop particle retaining
  - Potential reduction of contact time, beer losses, solved bitter compounds and polyphenols
  - Problem: Cost intensive

THANK YOU FOR YOUR KIND ATTENTION

For further info

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Visit

www.hopsteiner.de

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