

THE BREWDOG QUALITY PROGRAMME



**YAKIMA CHIEF HOPS
HOP & BREW SCHOOL
SEPT 2019**

**DR FRASER GORMLEY
GROUP HEAD OF QUALITY**

ME



LOVE HOPS AND LIVE THE DREAM



**OUR MISSION, FROM DAY 1, HAS BEEN TO MAKE OTHER PEOPLE AS PASSIONATE ABOUT
AMAZING BEER AS WE ARE.**

BREWDOG

CURRENTLY

2 PRODUCTION BREWERIES

2 PILOT BREWERIES

2 BREW PUBS

2 SOUR BREWERIES

1 DISTILLERY

1 CIDERY

67 BARS

COMING IN 2019

2 MORE PRODUCTION BREWERIES

4 MORE BREW PUBS

28 MORE BARS

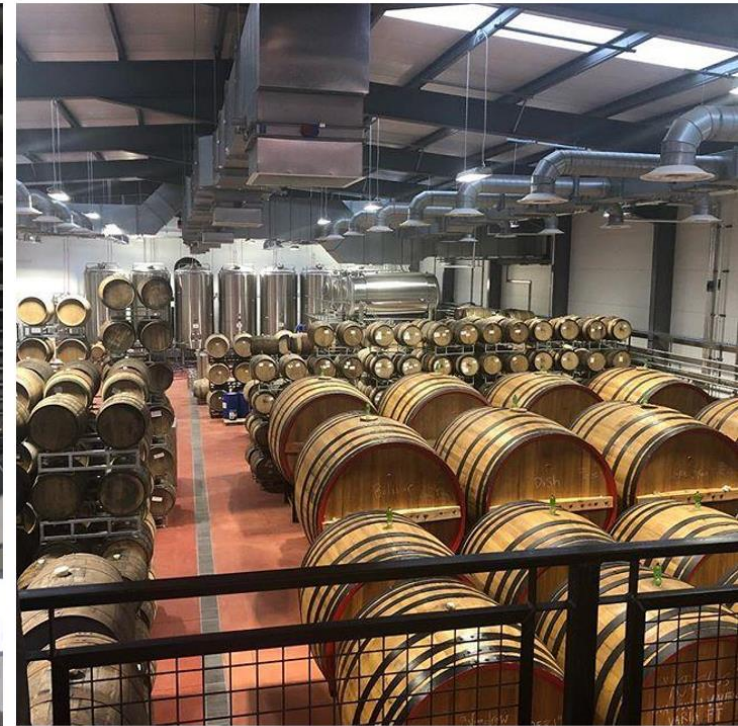


ELLON HQ*



***ALWAYS THIS SUNNY....**

ELLON HQ



COLUMBUS HQ



COLUMBUS HQ



OUR COMMITMENT TO QUALITY

- Global Quality programme across UK and USA with stringent BrewDog standards.
- 100% positive release of beers using our world class laboratories.
- 50 trained taste panellists & 20 elite level tasters – trained to identify and scale >60 flavours.
- Comprehensive vertical tasting programme for all beers.
- R&D + pilot programme for NPD.
- Full routine GC & HPLC profiling of all headliner beers.
- Relentless focus on raw material science and flavour quality.
- Quality department 'Dogs on Deck'.
- Accredited to both ISO 45001 & FSSC (People and Food safety).
- Trade Quality programme with customer audit schedule and field troubleshooting & training.



BREWDOG QUALITY

The background of the slide is a photograph of a hand pouring beer from a tap into a glass. Overlaid on this is a diagram with a central blue box at the top containing the text 'BREWDOG QUALITY'. A horizontal line extends from the bottom of this box, with six vertical lines branching down to six separate blue boxes arranged in a row. Each of these boxes contains a quality category name in white, uppercase letters. The categories, from left to right, are: 'FIELD QUALITY', 'PACKAGING QUALITY', 'LABORATORIES + R&D', 'SENSORY', 'TECHNICAL + COMPLIANCE', and 'HEALTH + SAFETY'. The boxes for 'FIELD QUALITY' and 'PACKAGING QUALITY' are partially obscured by the glass and the beer being poured.

FIELD QUALITY

PACKAGING QUALITY

LABORATORIES + R&D

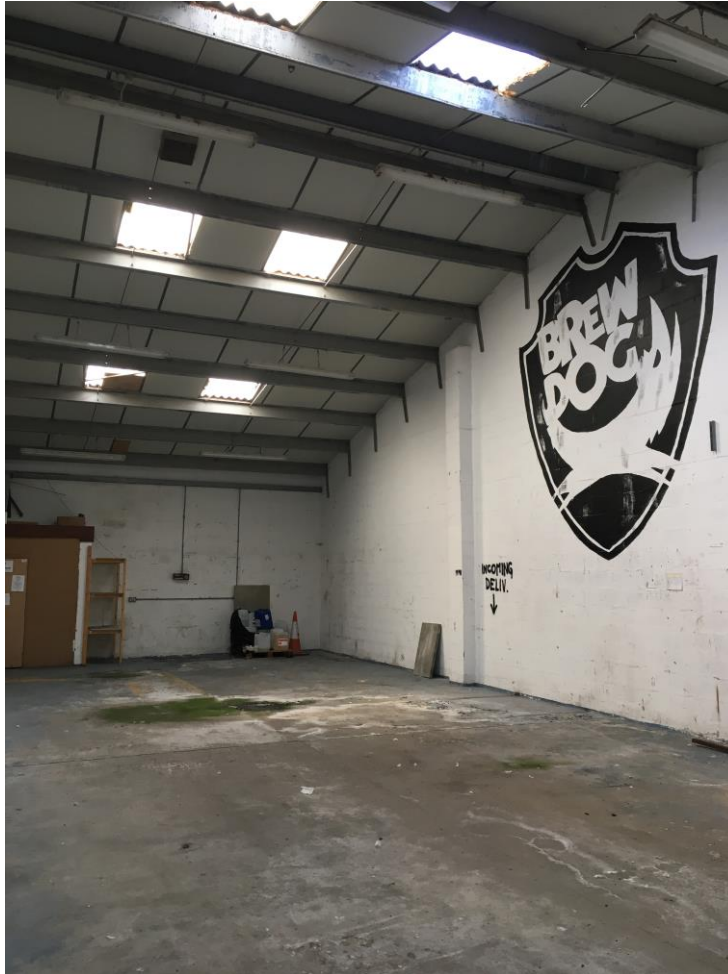
SENSORY

TECHNICAL + COMPLIANCE

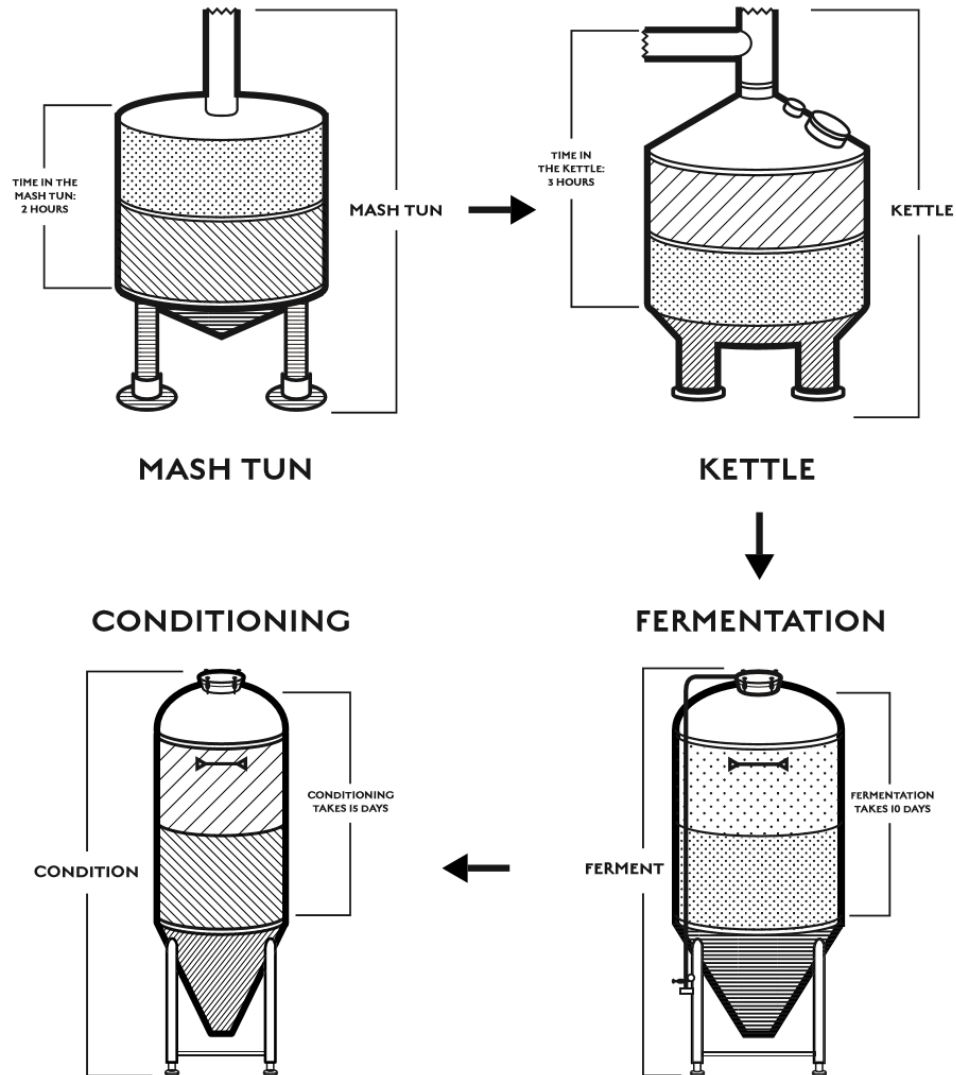
HEALTH + SAFETY



THE GOOD OLD DAYS!



OUR QUALITY PROGRAMME TODAY



PRODUCTION

RAW MATERIALS

BREWHOUSE

YEAST PLANT

CELLAR

BRIGHT BEER

PACKAGING

QUALITY

PHYSICAL/CHEMICAL, MICRO, SENSORY

WORT GRAVITY, PH, FAN, IBU, OXYGEN,
COLOUR, MICRO, SUGARS

VIABILITY, VITALITY, MICRO, FFT

VDKS, YEAST HEALTH, ABV, PH, COLOUR,
HAZE, MICRO, SENSORY, BPV, SUGARS

ABV, CO₂, O₂, HAZE, PH, COLOUR, MICRO,
SENSORY

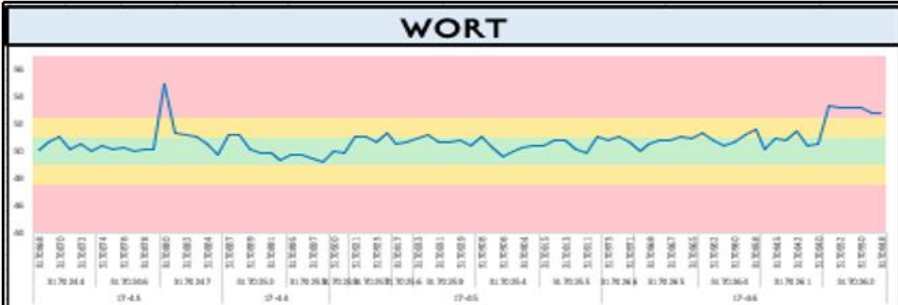
TPO, CO₂, MICRO, SENSORY, WEIGHTS AND
FILLS, SECONDARY PACKAGING CHECKS

QUALITY CONTROL LABS



TREND DATA AND IMPROVE

OG

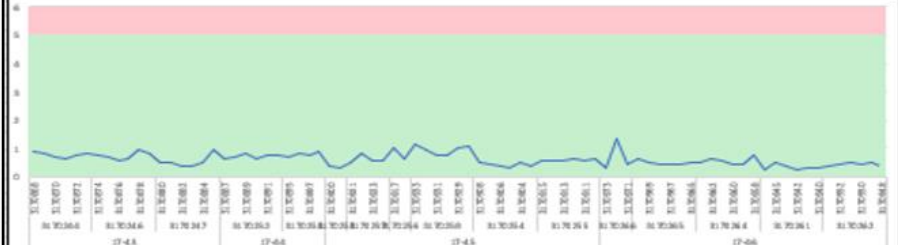


FINAL PRODUCT



ABV

Haze



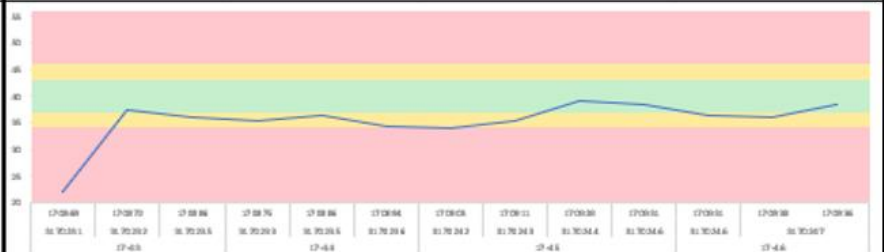
Haze

Colour



Colour

IBU



IBU

GC & HPLC



HPLC

- Bittering acids
- Fermentable sugars
- Organic acids.



GC-MS-O

- Profiling volatile compounds (liquid samples and raw materials)



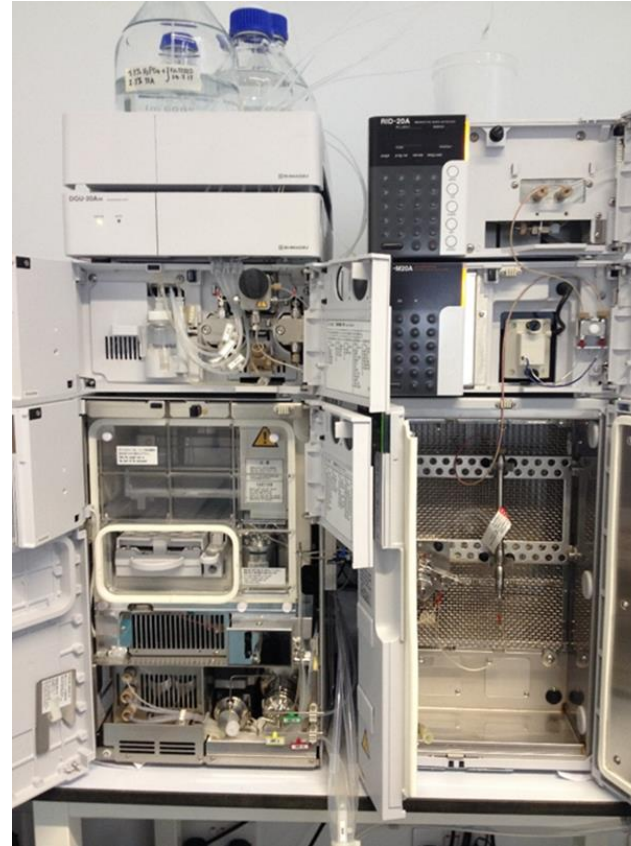
GC-flame ionisation detection (GC-FID)

- BPVs
- Methanol
- Higher alcohols



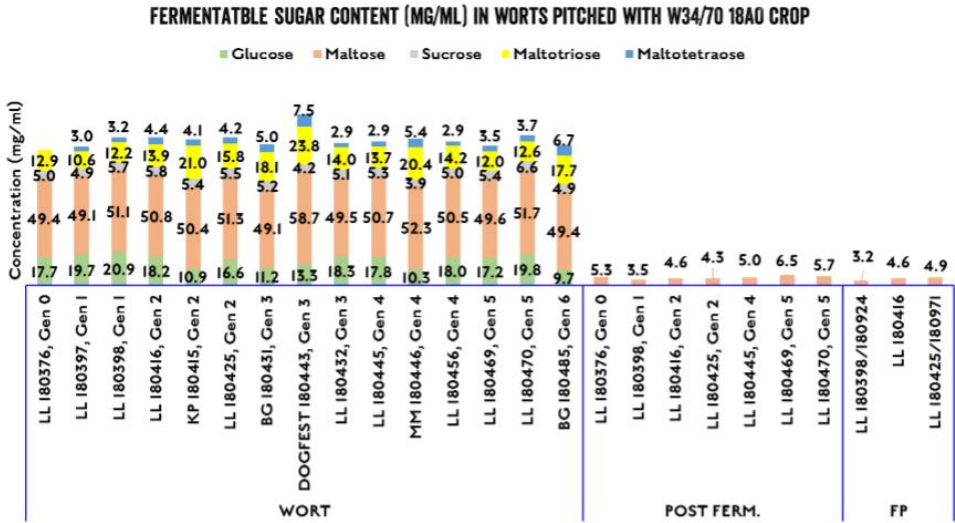
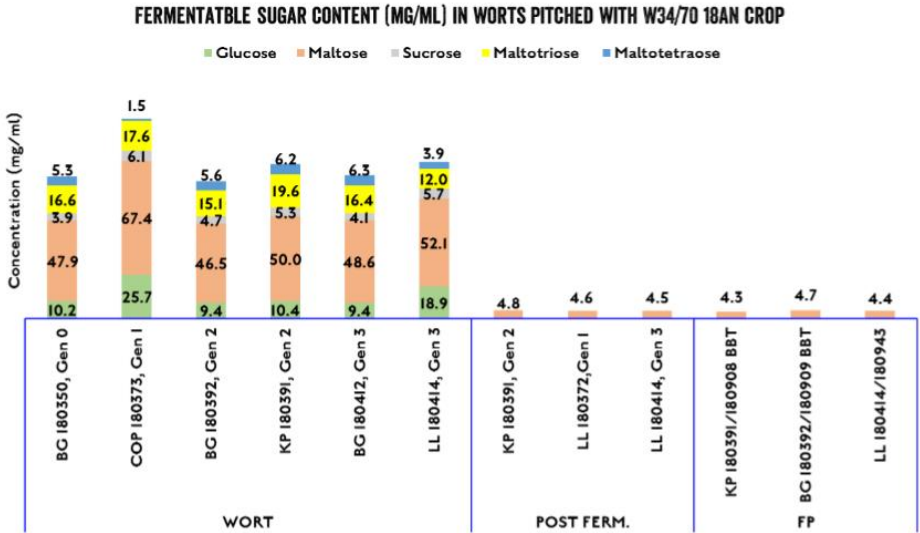
GC-pulsed field photometric detection (GC-FID)

- Volatile sulphur compounds

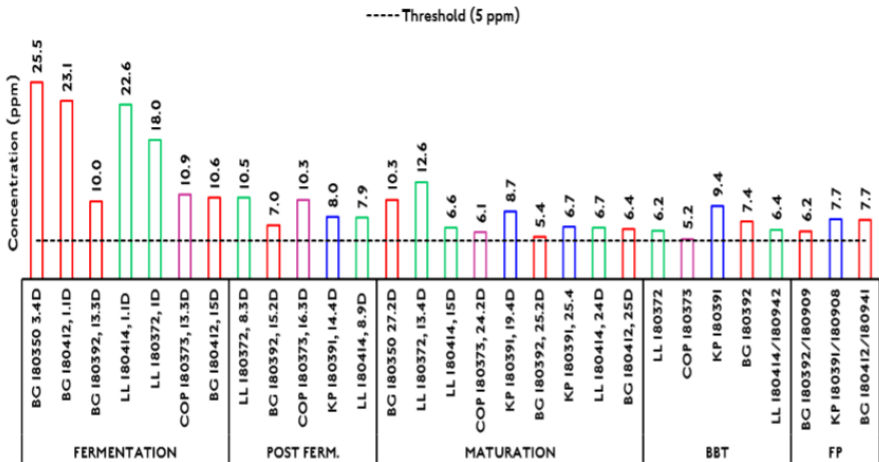


FERMENTATION PERFORMANCE

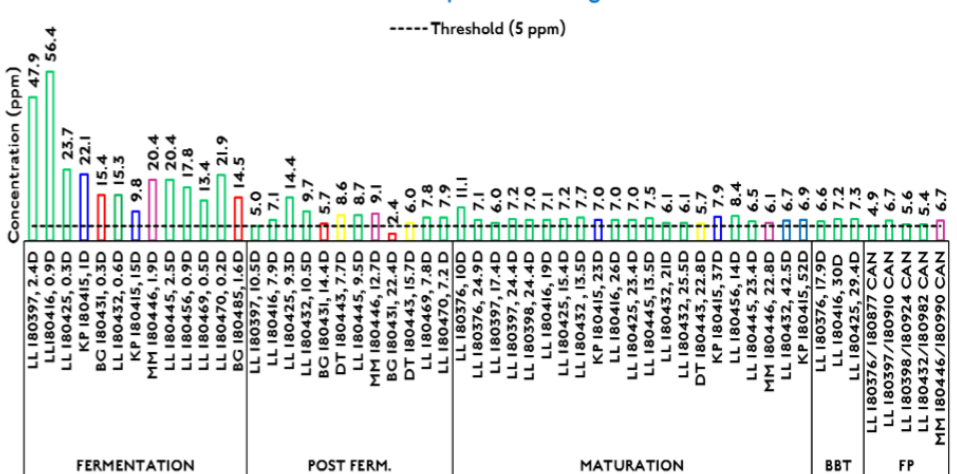
SUGARS



Acetaldehyde levels of beers pitched with W34/70 I8AN crop at different production stages



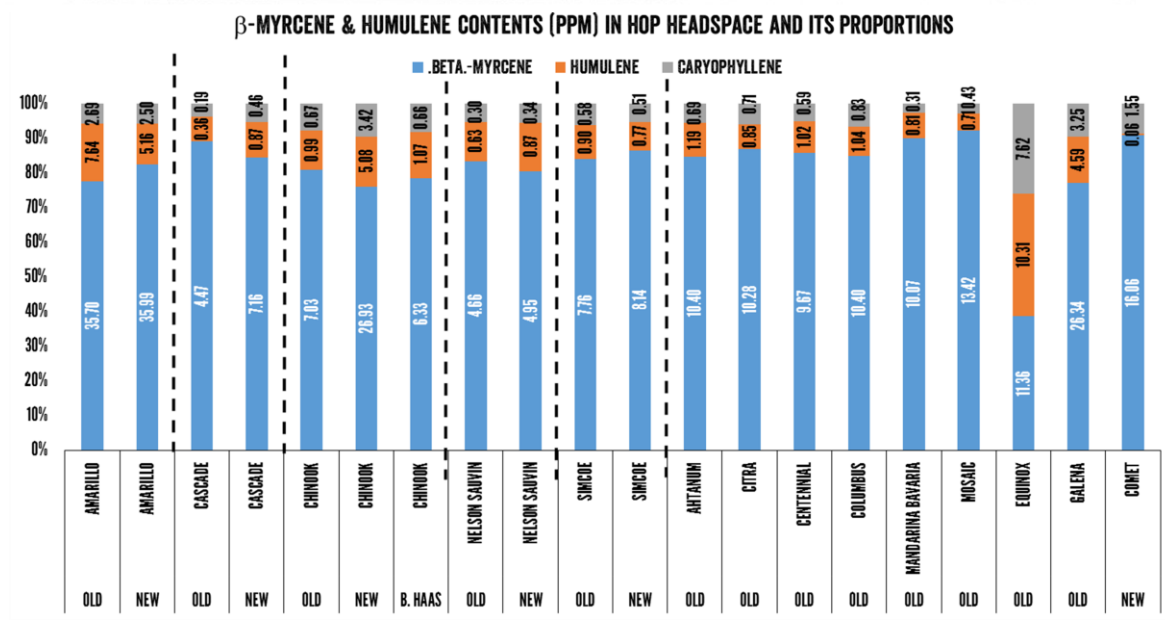
Acetaldehyde levels of beers pitched with W34/70 I8AO crop at different production stages



FERMENTATION COMPOUNDS



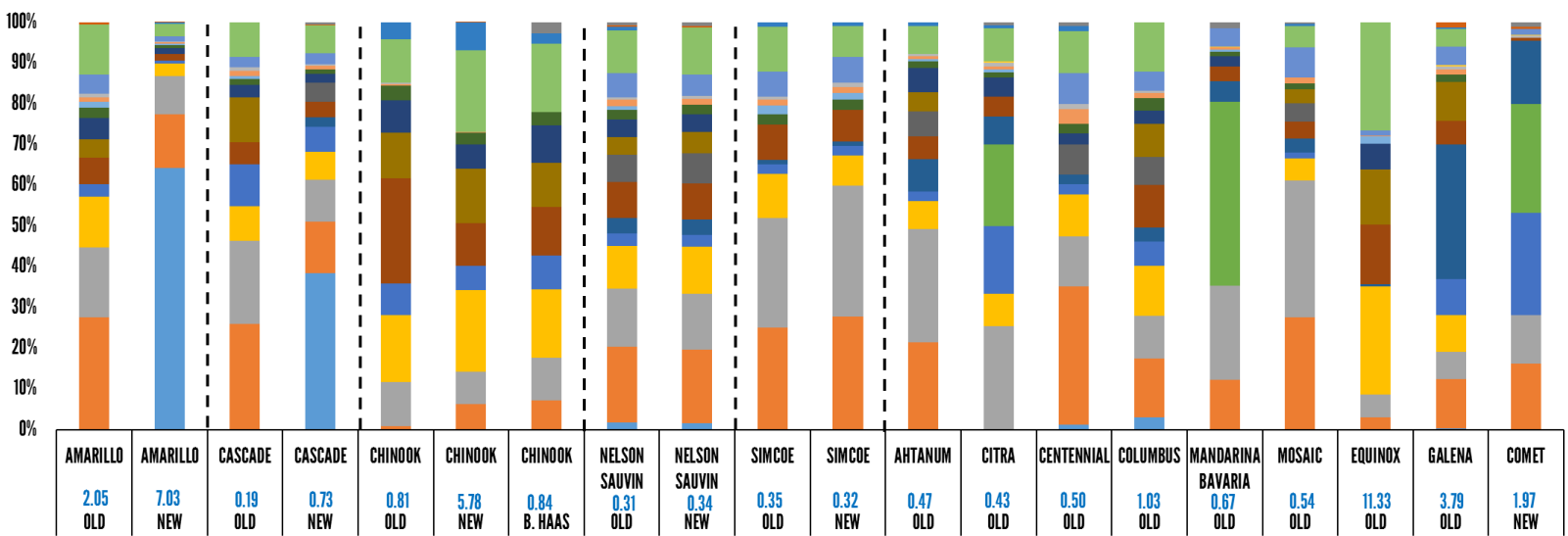
CG APPLICATIONS - HOP OIL ANALYSIS



- Hop oil analysis performed using Gas Chromatography.
- β-myrcene, humulene & caryophyllene predominant compounds.
- A ‘flavour active’ panel has been identified and we use this as an indication of hop aroma quality (for our own beers).

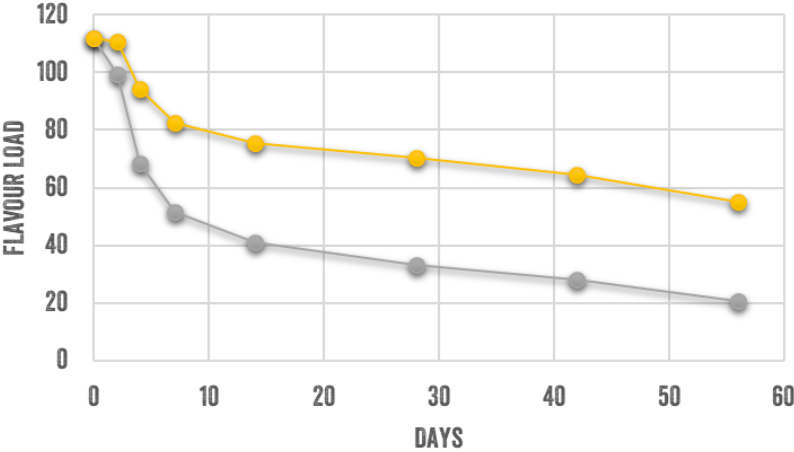


Contents of other essential oil volatiles in hop headspace. Values at the bottom denote total content (ppm)

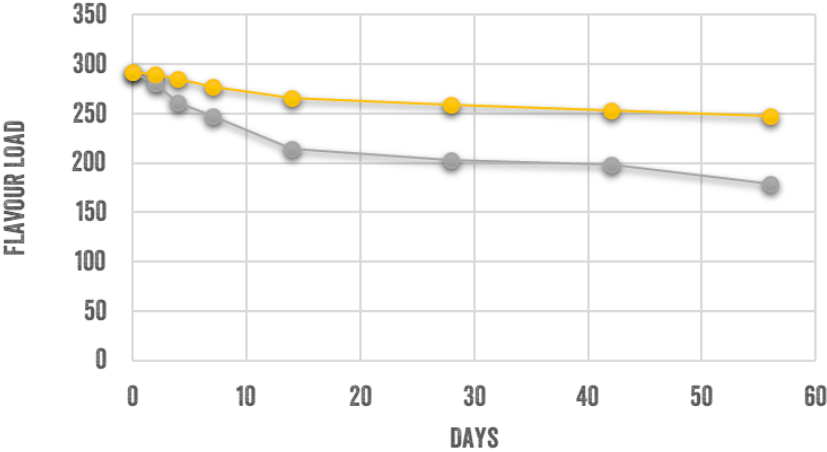


FLAVOUR DETERIORATION

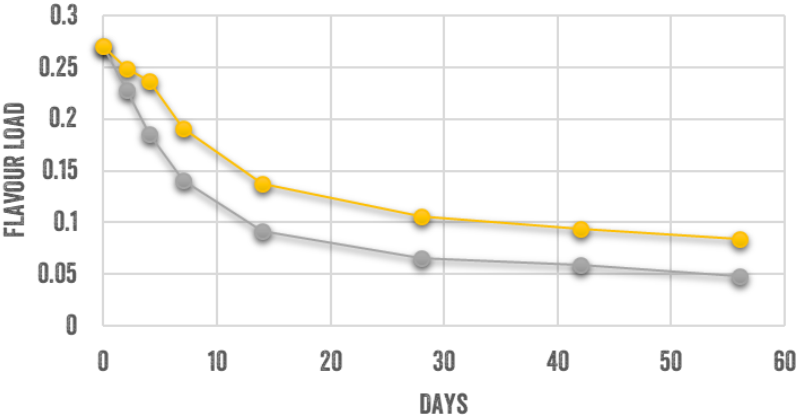
MYRCENE



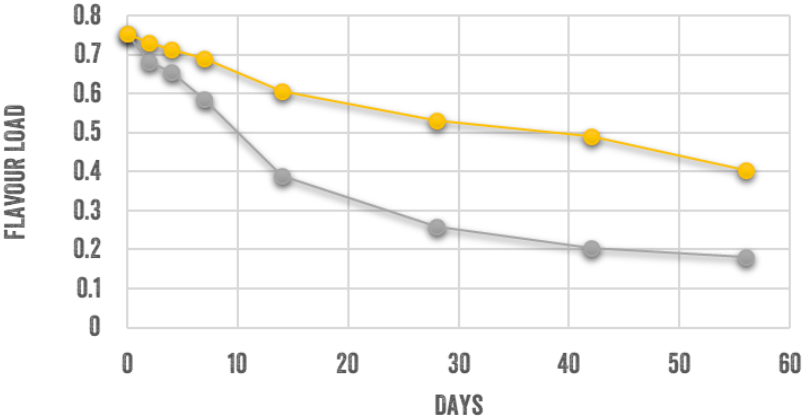
LINALLOOL



CARYOPHYLLENE



HUMULENE



PUNK IPA FLAVOUR MAP



#2

PUNK IPA 2010 - CURRENT

FIRST BREWED OCTOBER 2010

POST MODERN CLASSIC. SPIKY. TROPICAL. HOPPY.

ABV
5.6%IBU
40OG
1053

THIS BEER IS

Punk IPA. Amplified. In 2010 we finally got our paws on the equipment we needed to dry hop our beers. We focused all our energy on dry hopping, amping up the aroma and flavour of our flagship beer to create a relentless explosion of tropical fruits, and adding a hint of Caramalt to balance out the insane amount of hops.

BASICS

VOLUME	20L	5gal
BOIL VOLUME	25L	6.6gal
ABV	5.6%	
TARGET FG	1011	
TARGET OG	1053	
EBC	15	
SRM	7.6	
PH	4.4	
ATTENUATION LEVEL	78%	

METHOD / TIMINGS



MASH TEMP

66°C 152°F 75 mins



FERMENTATION

19°C 66°F

INGREDIENTS



MALT

Extra Pale	4.38kg	9.6lb
Caramalt	0.25kg	0.55lb



HOPS

	(g)	Add	Attribute
Chinook	20	Start	Bitter
Ahtanum	12.5	Start	Bitter
Chinook	20	Middle	Flavour
Ahtanum	12.5	Middle	Flavour
Chinook	27.5	End	Flavour
Ahtanum	12.5	End	Flavour
Simcoe	12.5	End	Flavour
Nelson Sauvin	12.5	End	Flavour
Chinook	47.5	Dry Hop	Aroma
Ahtanum	37.5	Dry Hop	Aroma
Simcoe	37.5	Dry Hop	Aroma
Nelson Sauvin	20	Dry Hop	Aroma
Cascade	37.5	Dry Hop	Aroma
Amarillo	10	Dry Hop	Aroma



YEAST

Wyeast 1056 - American Ale™

FOOD PAIRING



Spicy carne asada with a pico de gallo sauce

Shredded chicken tacos with a mango chilli lime salsa

Cheesecake with a passion fruit swirl sauce

PACKAGING

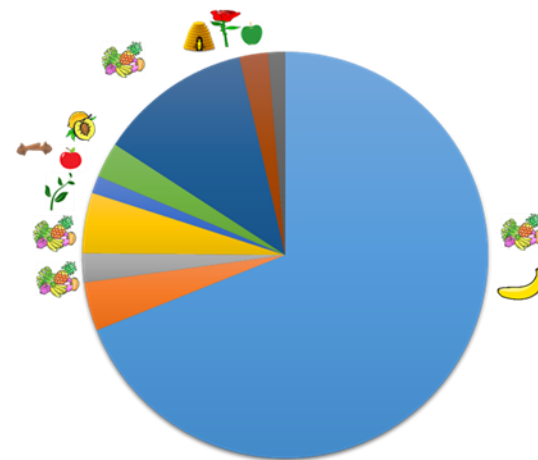
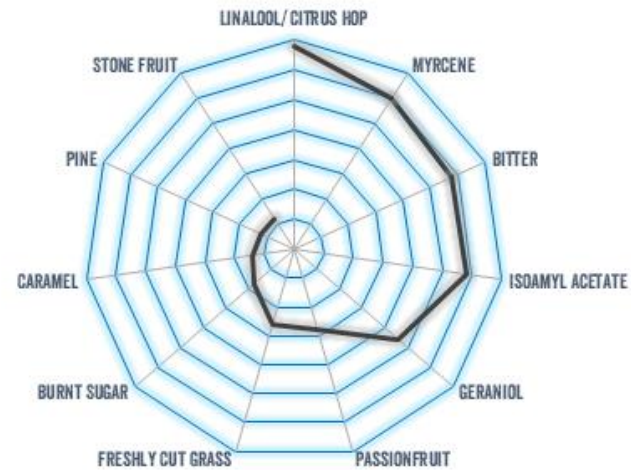


BREWER'S TIP



To get the best possible profile from the dry hops we recommend dry hopping post fermentation for 5 days. Dry hops should be added at cellar temperature. We find 14°C results in the most aromatic dry hop profile.

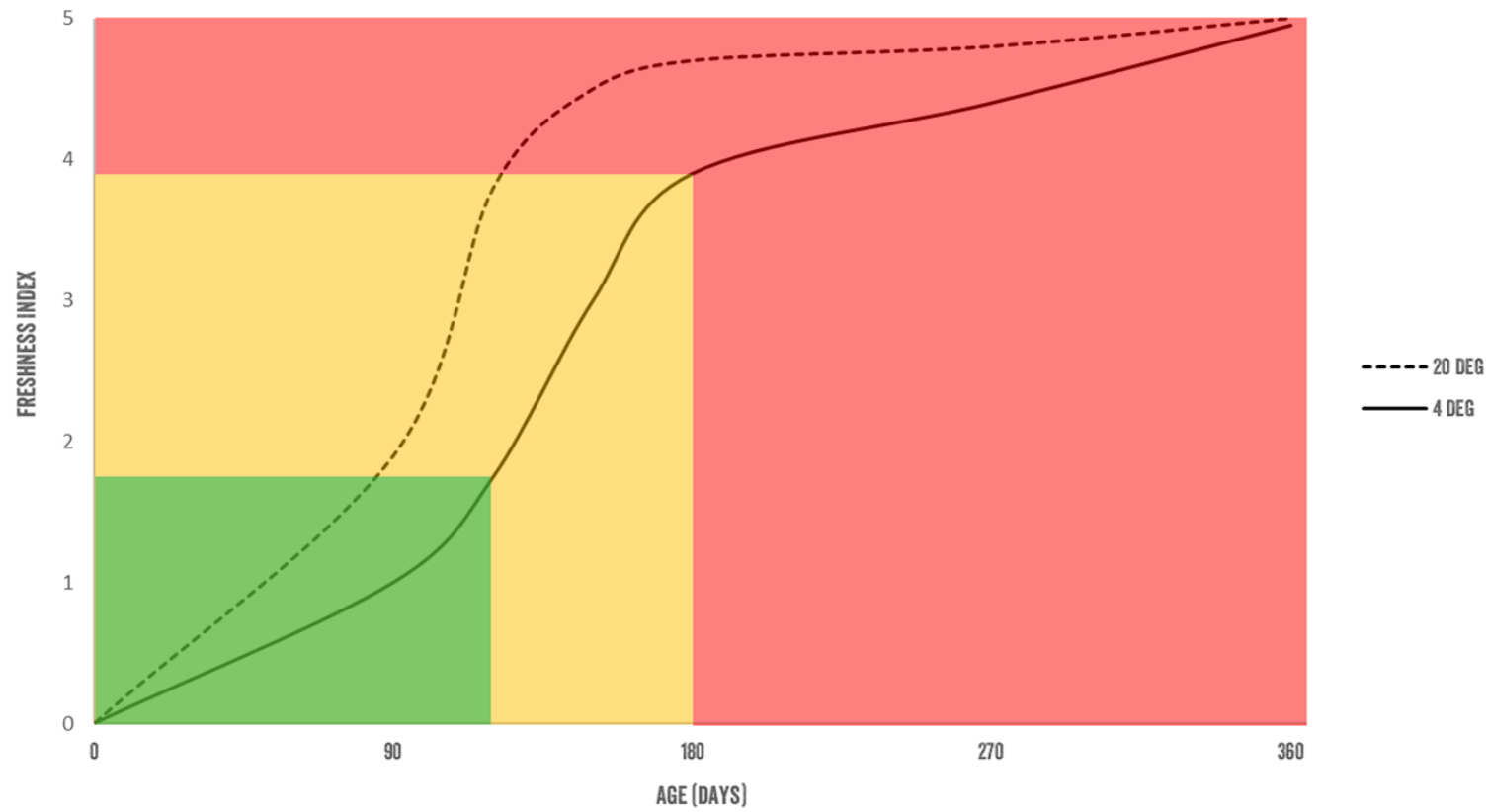
PUNK IPA



- Isoamyl acetate
- Isobutyl isobutyrate
- 2-Methylbutyl propionate
- beta-Myrcene
- Ethyl hexanoate
- iso-Amyl iso-butyrate
- 2-Methylbutyl isobutyrate
- Phenylethyl Alcohol
- Ethyl caprylate

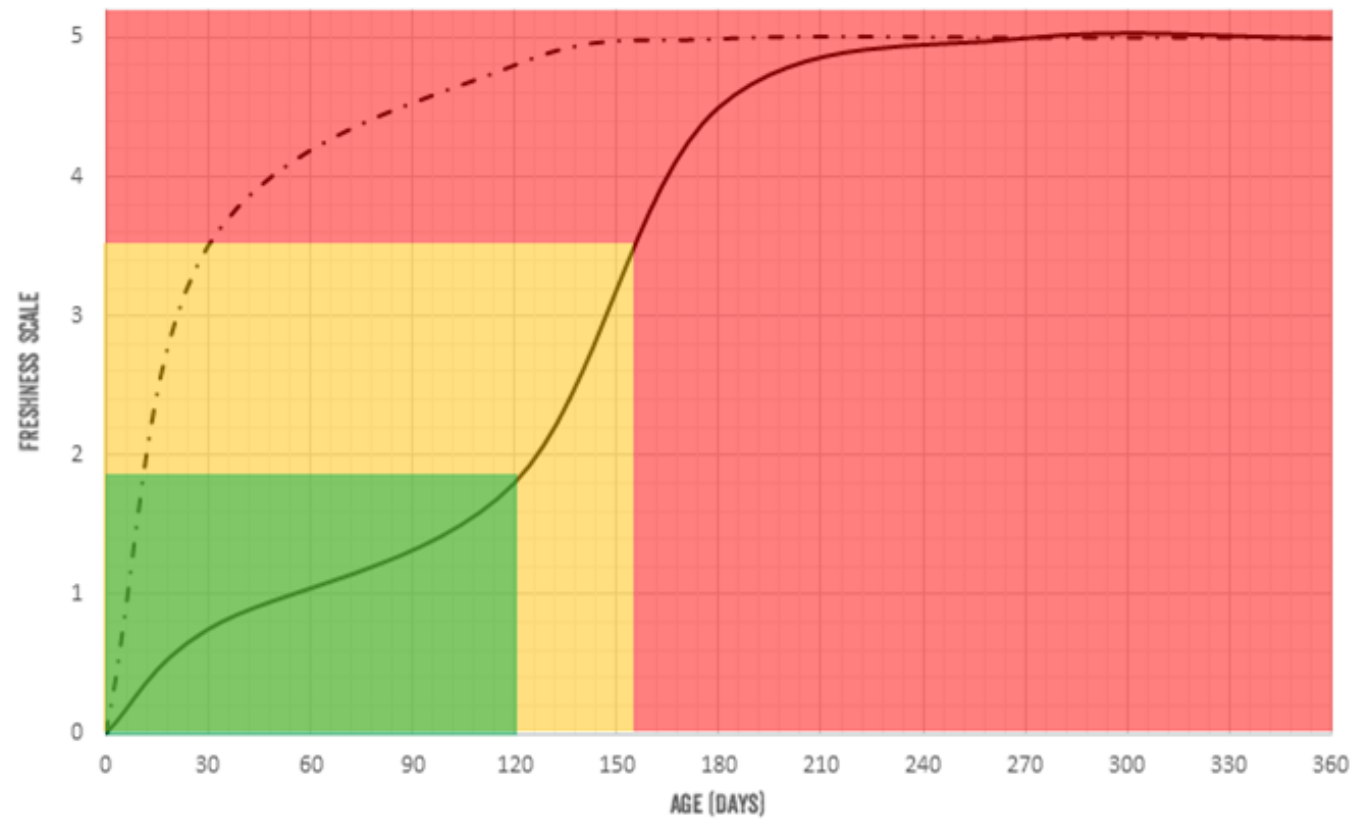
FRESHNESS INDEX

PUNK FRESHNESS SCALE



FRESHNESS INDEX

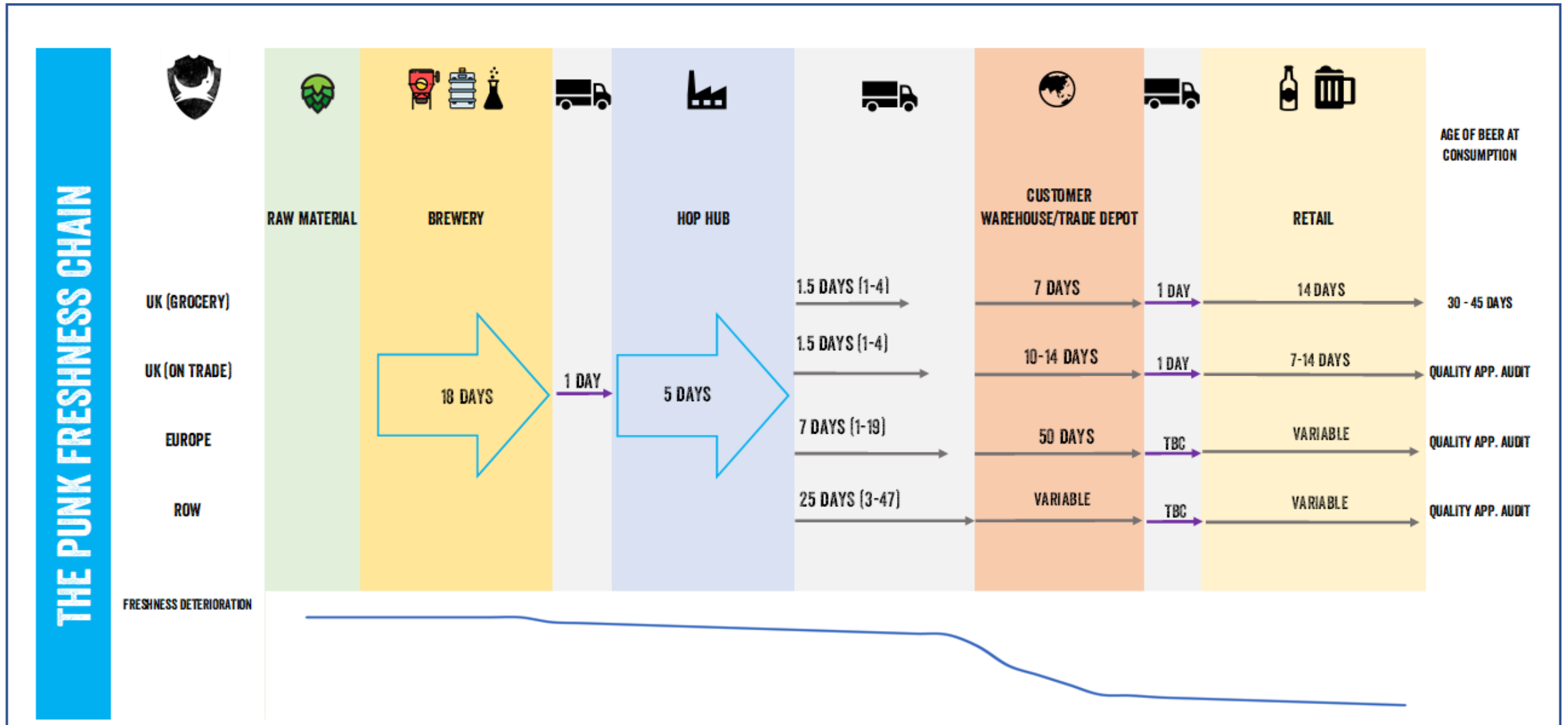
HAZY JANE FRESHNESS SCALE



— 4DEG
- - - 20DEG

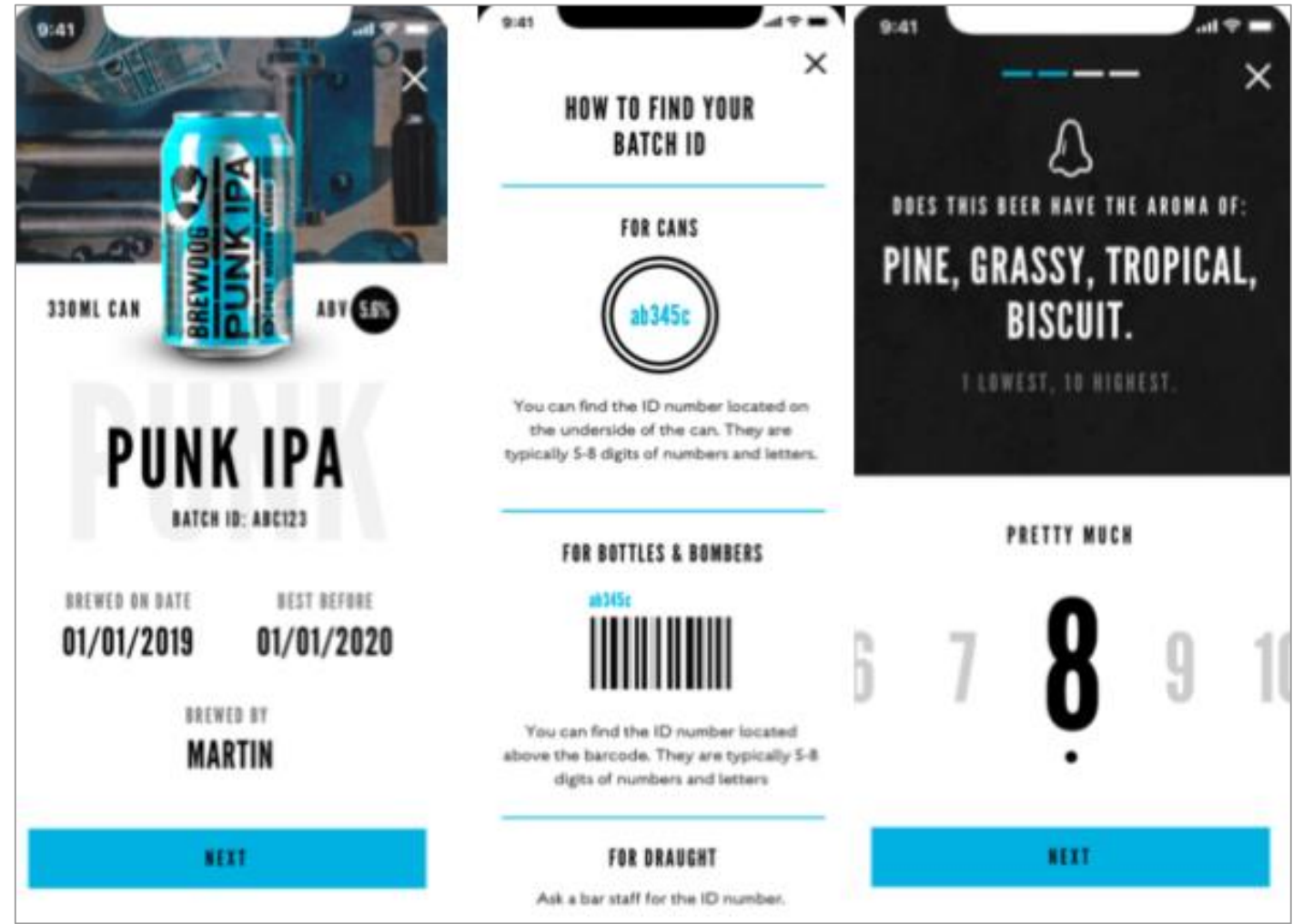


THE FRESHNESS CHAIN



DOWNSTREAM QUALITY

BREWDOG QUALITY APP.



User account: <https://www.brewdog.com/uk/customer/account/create/>
App download: <https://apps.apple.com/gb/app/punk-panel/id1450000016> Apple) or https://play.google.com/store/apps/details?id=com.punkpanel&hl=en_US (Android)



BEER QUALITY RECOMMENDATIONS

Our team at BrewDog work tirelessly to produce the best quality beer possible. It is incredibly important to us that our beer reaches our fans, no matter where they are in the world, in the best possible condition and as such we ask all distributors and stockists of our beers to follow the below recommendations:

BEER STORAGE



BrewDog beers best stored and served below 10°C (50°F).
BrewDog beers should never be stored or served above 20°C (68°F).



Warehouse residency time of BrewDog beers should be kept to an absolute minimum to maximize freshness. Fresh beer is better beer.




BrewDog beers should be kept out of direct light.
BrewDog beers should be kept in dry and clean conditions.

BEER APPEARANCE



BrewDog beers are not pasteurised or treated with any stabilisers. Due to the quantity of hops used in both wort boiling and for dry hopping, it is not uncommon to observe a slight haze in the beer. This haze is non-microbiological and is most often the result of proteins (primarily from malt) and polyphenols (from hops) interacting. This does not adversely affect beer quality.




BREWDOG KEY KEG DISPENSE GUIDELINE

KEY KEGS – AN OVERVIEW


BrewDog use Key Kegs as a single journey container for beer to be dispensed through a draught system. Key Keg design differs from traditional kegs in several important aspects. Key Kegs consist of an Alufol bag (this contains the beer) suspended in a plastic vessel. Traditional kegs dispense beer by pressurising the inside of the vessel, forcing the beer up through the spear in the centre. Key Kegs dispense by pressurising the plastic vessel, squeezing the Alufol bag and forcing the beer through the top of the keg.

PRINCIPLES OF KEY KEG DISPENSE


To dispense beer successfully the equilibrium of dissolved Carbon Dioxide (CO₂) must be maintained. The following variables must be taken into consideration when dispensing from a key keg.



Temperature affects the solubility of CO₂ in beer. As temperature increases the solubility decreases and CO₂ can more easily escape from the beer. We recommend that BrewDog beer should be stored at 10°C or below. This ensures the quality of the beer and extends its shelf life as well as helping to prevent foaming issues.



Pressure is the amount of gas pressure required to maintain the correct level of CO₂ in the beer. This is affected by the temperature, resistance and atmospheric pressure. BrewDog beer is carbonated to between 4.6 and 4.8 g/l of CO₂ and so pressure should be set to maintain this level of carbonation.



Resistance comes from the draught system components (e.g. beer line) and changes in elevation. The resistance of the draught system must be taken into consideration when setting the pressure. Please contact whoever installed your draught system for this value. If the equilibrium is not maintained complications can occur usually resulting in gas break out and foaming.

SHELF LIFE



For stainless steel keg packaged beer (for domestic on-trade), BrewDog beers have a recommended shelf life of 3 months.



BrewDog beers should not be sold outside the recommended shelf life.




For beers shipped internationally to KeyKeg on-way kegs, BrewDog recommends a shelf life of one year from packaging date, for maximum flavor and freshness. BrewDog beers are best consumed within 90-120 days.

The above points are dependent on strict adherence to storage and serving temperature recommendations.

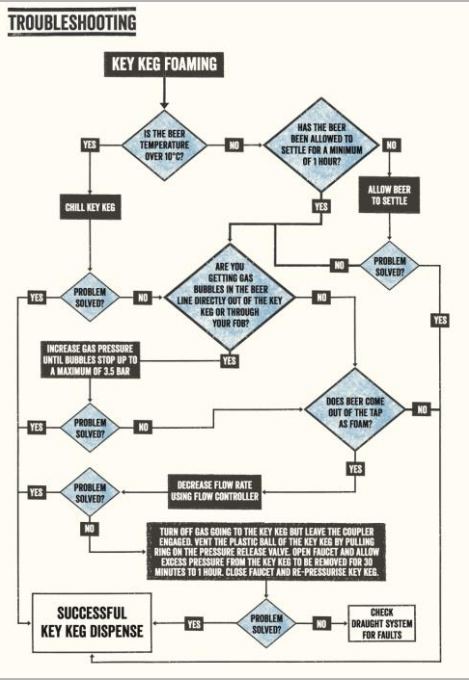
BEER SERVICE



Ensure the correct pressure setting when dispensing BrewDog beer from a draught system. This will ensure the correct level of CO₂ is maintained in the beer. The majority of BrewDog beers are carbonated between 4.6 and 4.8 g/l (0.8 to 2.4 volumes of CO₂). Any differences in carbonation level in a brand will be communicated separately. Please be aware that the required pressure setting will be affected by the draught system set up and beer container type.



Ensure temperature recommendations are followed. Temperature affects the solubility of CO₂ in beer. Higher temperature means CO₂ escape from the beer. If temperature is raised beyond recommended levels, there is a greater likelihood of beer foaming. High temperatures also have an adverse effect on flavour stability.





QUESTIONS!