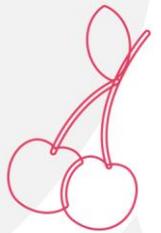
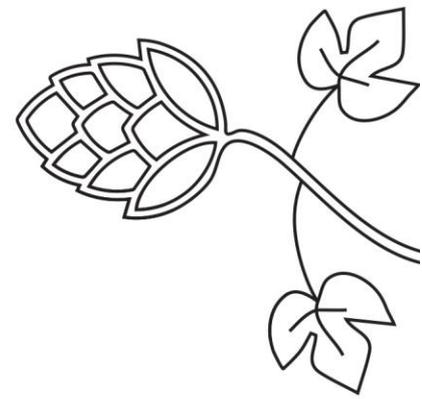
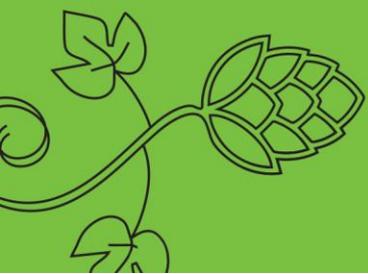
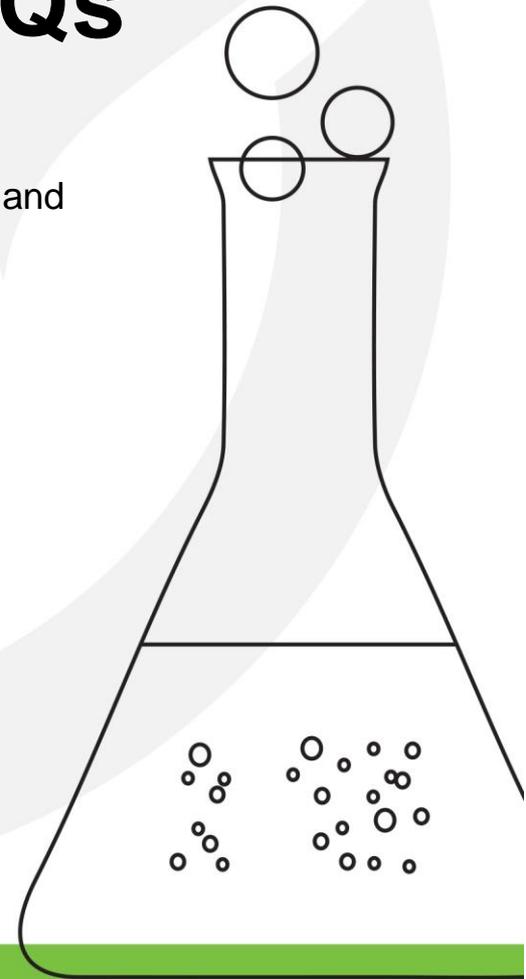


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# HopInspiration® products & FAQs

An informative guide to using all  
natural hop products for the brewing and  
greater beverage industry.



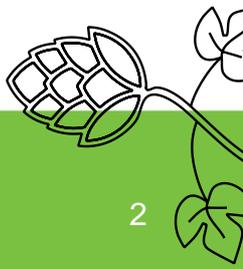
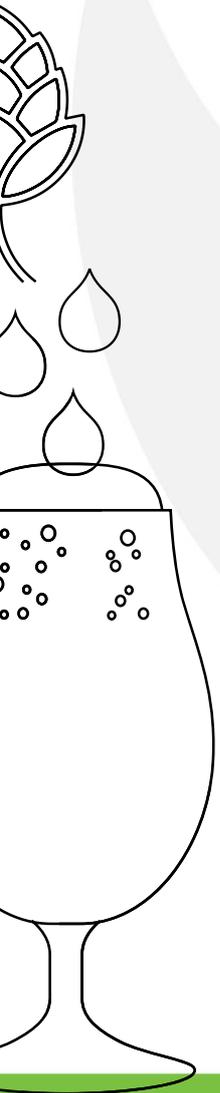
With our **KNOWLEDGE** and **PASSION**  
we create **INNOVATION**



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# 1. Frequently Asked Questions

## Q: What are hop products?

**Hop products are extracts and essential oils made from whole cone hops to partially or fully replace the use of pellets or whole hops.**

Traditionally, hop extracts for bitterness are produced utilising strong solvents to extract soft resins. Hop oils are produced utilising various essential oil production techniques such as steam distillation, cold-press, solvent extraction and supercritical CO2 extraction.

## Q: What makes Totally Natural Solutions Hop Products different from other products on the market?

**Our production process is 100% natural, using real hops and no chemical solvents or additives.**

Our HopInspiration® products can be used as a partial replacement or a full replacement of kettle, whirlpool, and dry-hop additions. All of our products do not contain toxic residues.

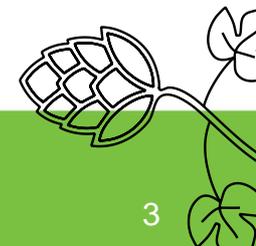
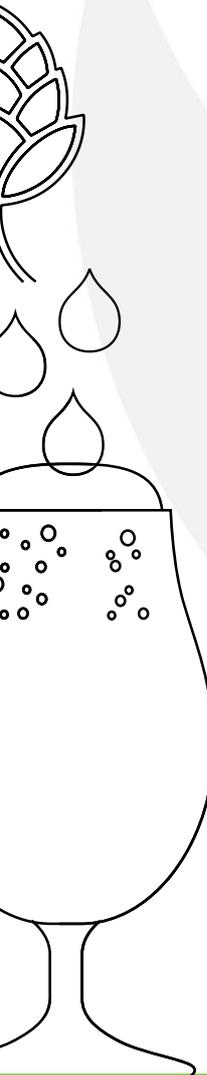
## Q: Why use hop products?

### **Increased Efficiency and Tank Capacity.**

The use of hop products eliminates beer losses due to vegetative hop material. As a result of this, production capacity is slightly increased which could yield substantial profits and savings.

### **Consistency in Utilisation**

Identical concentrations of Iso-alpha acids, flavour, and aroma concentrations can be added to each batch of beer as the potency should remain consistent. As with whole cone or pelletised hops, each harvest year will vary slightly. This can be adjusted and specification sheets on key terpenoids can be provided upon request.





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## **Product Stability**

Essential oils are stable when stored at room temperature. However, our current storage guidelines recommend cold storage, between 1-5°C, to prevent headspace losses and retain volatiles in solution. The products are sold with a 12-month best before date.

## **Beer Stability**

As beer ages, research has concluded that aroma and bitterness changes. Our HopInspiration® range provides a more stable bitterness and aroma due to low concentrations of staling aldehydes.

## **Effective Storage and Transport**

While the use of hop products greatly reduces beer losses, storage space is saved and transport costs are reduced. As hop extracts and oils are highly concentrated, only a small amount is required.

## **Decreased Polyphenols/Tannins**

'Dry-hop' additions with our aroma-based HopInspiration® products do not increase turbidity. The polyphenolic content of the HopShot®, HopBurst®, and HopSensation® and HopZero® is below levels of detection and therefore, cannot cross-link with beer proteins.

## **Absence of Pesticide Residues**

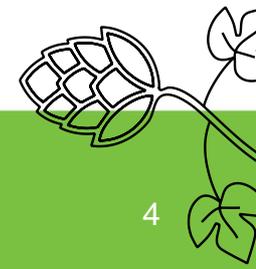
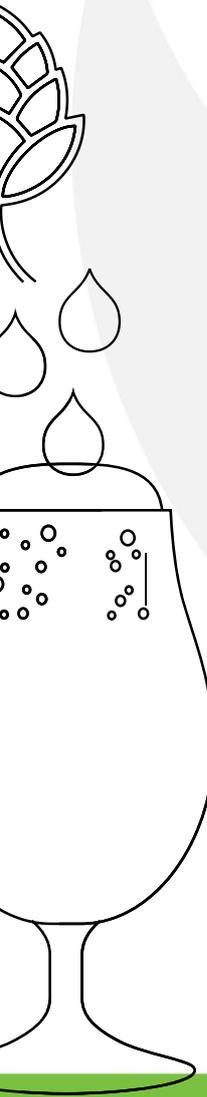
All hop cones and pellets used by Totally Natural Solutions are sourced from approved suppliers with strict quality and pesticide residues standards. Where pesticides have been used, traces are within lower detection limits and only approved pesticides have been used.

## **Absence of Heavy Metals**

Products in the HopInspiration® range are all distilled hop oils and the process does not allow any transfer of heavy metals into the finished products.

## **Absence of Nitrates**

In dry hopping, nitrates can leach from green hop material into beer and cause issues with haze. Products in the HopInspiration® range are nitrate free and do not induce hazes.



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## Q: Are hop product residues difficult to clean from equipment?

**After using a hop product, cleaning of the equipment is easy and effective.**

A hot-water flush and/or standard CIP procedures should sufficiently clean the tank and remove any remaining aroma.

## Q: What is the dose rate?

**Start small.**

Our HopInspiration® products are highly concentrated. Dose with caution and perform benchtop trials before dosing the products into commercial batches. Dosing will depend on beer style and brewer preference.

Generally, we suggest:

- Lager/Pale/Lighter Beer Styles: dose at 10-20 g/hL and increase as desired.
- IPA/Hoppy Beer Styles: dose at 30-40 g/hL.
- **IMPORTANT**: It is crucial to consider the composition of the beer flavour matrix. Characters from malt, yeast and alcohol content impact dose rate. Due to this, it is important to determine optimum dose rates per beer. For example, beers with high alcohol content may require dosages up to 60 g/hL.

## Q: When should the products be added?

**Post-fermentation.**

Post-fermentation addition with sufficient blending time (2-4 hours) is a good place to start. However, we acknowledge that every brew house is different and that every brewer will have differing opinions on late/dry-hop addition. We encourage experimentation and trials to determine optimum points of addition.

## Q: How do I dose the products?

**Ensure the product is properly mixed.**

It is important to ensure that the product is evenly mixed and distributed. Select a dosing regime to ensure that the product can be evenly mixed. In benchtop trials, dose the products, swirl to mix, and let the products sit at least five minutes to marry with the beer matrix.



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### Q: Can the product be used after the 'Use by' date?

**Yes.**

If unopened and stored at ambient or cold temperatures, the hop product is safe to use. However, a test for strength (bitterness, aroma, etc.) is strongly recommended. If in doubt, do not use the product. If greater than 12 months out of date (24 months from manufacture) the product should be disposed of and not used in beer.

### Q: Are the products vegan/vegetarian compliant?

**Yes.**

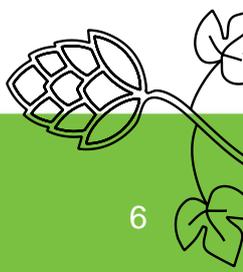
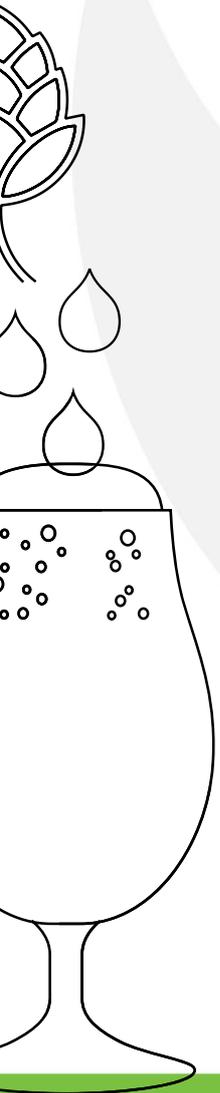
All of our products are vegan/vegetarian and are produced from whole cone hops and pellets without solvents.

### Q: Can part of a flask be used at a later date? How is the shelf life affected?

**Yes.**

Part used flasks can be resealed and reused at a later date. Some hop volatiles may evaporate into the headspace and be lost once the flask is reopened. We suggest cold storage and not to store flasks with less than 80% of the contents for longer than six months. The product may also be decanted into a smaller suitable container with a tight seal to reduce the headspace.

For example, a brewer orders a one litre flask and requires 100 mL of product per brew. The remaining 900 mL in the flask following the first use may be decanted in nine, 100 mL bottles, sealed, and stored cold for later use.



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## 2. Product information

**Table 2.1 HopInspiration® Core Range**

Product	Aim/Replacement	Dose Rate*	Addition**
<b>HopShot®</b>	Whirlpool/late hop flavour and aroma	Range: 5-40 g/hL (best results typically vary between 10-20 g/hL)	Post-Fermentation
<b>HopBurst®</b>	Dry-hop flavour/aroma	Range: 5-40 g/hL	Post-Fermentation
<b>HopPlus®</b>	Fruit or spice additions	Range: 20-30 g/hL	Post-Fermentation
<b>HopAlpha®</b>	Pre-isomerised alpha acid extract for bittering	Per 10 IBU addition: HopAlpha Iso 30% = 3.5g/hl HopAlpha Rho 30% = 3.5g/hl HopAlpha Tetra 9% = 11.7g/hl HopAlpha Niso 25% = 4.2g/hl	Post-Fermentation
<b>HopZero®</b>	Bitterness, body, mouthfeel, and late-hop aroma for low and non-alcoholic beverages	Range: 5-40 g/hL	Post-Fermentation
<b>HopSensation®</b>	Blends of late hop flavours and dry hop aromas to give more rounded hop character.	Range: 5-40 g/hL	Post-Fermentation

\*We encourage experimentation with our products and combining products to obtain desired flavours and aromas. Dose rates may vary depending on base beer. The optimal dose is based upon data obtained from benchtop and brewer trials.

\*\*Products can be added earlier in brew house processes. Trials are required to determine optimum point of addition.



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## Additional product information



### HopShot®

- HopShot® is composed of hop oil fractions with spicy, floral, herbal, citrus, fruity and woody characters for late hop replacement and/or enhancement of whirlpool-derived aromas and flavours.
- Can improve mouthfeel, body, and perceived bitterness.
- HopShot® is available in varietal late hop characters for hops such as Saaz, Cascade, Target and many others.
- Other HopShot® products are designed for specific beer styles such as lager, British-style ale, IPA, stout, German styles and Belgian styles to add hop character easily and reproducibly.



### HopBurst®

- HopBurst® products are offered as whole varietal hop oils from the United States, Germany, United Kingdom, and Australia.
- HopBurst® are particularly suited for hoppy beer styles, providing a fresh burst of dry-hop character.
- The use of HopBurst® results in no loss of beer volume through adsorption into spent hop, realising substantial cost-savings.
- Streamlined contact time of 2-4 hours (kit-dependent) opposed to extended contact times for hop cones/pellets.



### HopPlus®

- HopPlus® is hop oil extract blended with other natural and botanical extracts for a speciality beer application (i.e.- fruit-flavoured ales, fruit-flavoured sour beers, etc.).
- Dosed post fermentation, the products contain only aroma and flavour. No fermentable sugars are present.
- Range includes honey, chocolate, fruits (mango, banana, kiwi, lime, lemon), berries (strawberry, raspberry, blueberry) and other seasonal offerings (pumpkin spice, Christmas ale).

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HopAlpha®

- HopAlpha® is available to brewers in a range of bitterness intensities.
- HopAlpha® is light-stable (inhibits lightstruck flavour) and enhances foam head retention.
- Cost in use of bittering greatly reduced with the use of the product.



HopZero®

- HopZero® is a product specifically designed for use in low and non-alcoholic beers.
- The HopZero® range offers improved bitterness, mouthfeel, body, and aroma to low and non-alcoholic beers in addition to low alcohol sours.

### Q: What varieties are available as HopShot® and HopBurst®?

**Up to 50 varieties are always in stock. Others available on request (MOQ may apply).**

Varietals available per origin:

- *United Kingdom:* Target, Admiral, Golding, Challenger, WGV.
- *United States:* Cascade, Chinook, Centennial, Willamette, Summit, Citra, Simcoe, Amarillo, and Mosaic.
- *Europe:* Saaz, Styrian Golding, Hersbrucker, Perle, and Northern Brewer.
- *Australia:* Galaxy and Vic's Secret.

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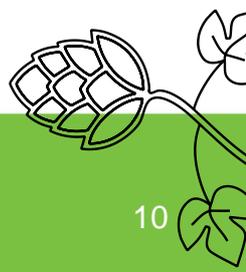
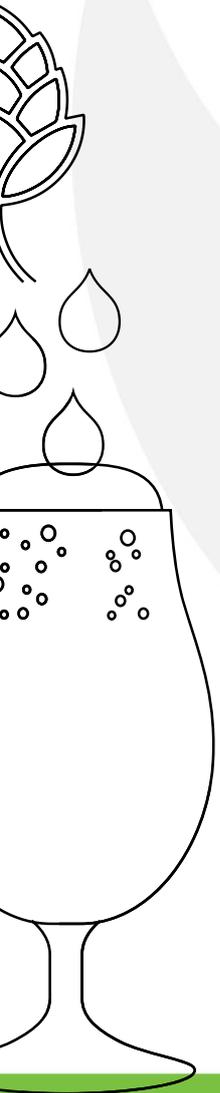
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## 3. Selecting, dosing, and scaling up of HopInspiration® products

### 3.1 Selecting a HopInspiration® Product

1. Use 500 mL amber bottles, Erlenmeyer flasks, or jugs to prepare samples (**Appendix A**). Collect enough containers for each sample tested, plus one for a control.
2. Label each container/jug according to product and dose rate used. Label one sample container/jug as a reference sample.
3. Carefully decant 200 mL of cold beer (8-10°C) into each test container/jug desired.
4. Swirl to slightly de-gas the beer.
5. Immediately use dropper pipette (**Appendix A**) to add at least one drop of the desired HopInspiration® product to each bottle. This can be repeated to increase intensity (e.g. use 2 drops of the same oil to the next bottle, etc.).
  - a. DO NOT add any TNS hop oil to the reference sample. This sample is to be kept as a control for comparison.
  - b. Always use a fresh pipette for each HopInspiration® product to prevent cross-contamination.
6. Seal the container/cover the sample.
7. Swirl each sample to mix and wait five minutes for the product to blend with the base beer. Sensory assessment should be carried out shortly after blending time. However, if required, samples can be covered refrigerated for up to three hours.
8. Record preferences on the sensory assessment sheet. The American Society of Brewing Chemists Methods of Analysis, Sensory Analysis-18 provides a comprehensive guide to tetrad testing. Alternatively, **Appendix B** outlines and provides a quick guide for differential and preferential assessment.
9. Repeat the procedure for each trial.





### 3.2 Determining a Dose Rate for HopInspiration® Products

1. Collect enough in-process beer from the anticipated location of oil addition (e.g. – whirlpool, bright beer tank, etc.) ideally, the sample should be between 2-8°C.
2. De-gas beer carefully by shaking in sealed collection containers. Alternatively, in-process beer can be centrifuged to de-gas and clarify the sample.
3. Determine dose ranges to be tested and label sample container/jugs accordingly. It is recommended to test a range of concentrations for each HopInspiration® product investigated.
  - a. Example: Begin dosing with 10 µl of product into 200 mL of beer and increase to 40 µl (e.g.- Sample 1= 10 µL, Sample 2= 20 µL, Sample 3= 30 µl, etc.).
  - b. The dose range will depend upon base beer style and selected HopInspiration® oil. Suggested dose rates are 5-50 mL oil per US bbl/5-40 mL per hL.
4. Carefully decant 200 mL of beer directly into labelled sample containers/jugs.
5. Dose each beer sample accordingly with a micropipette (Appendix A).
  - a. It is important to use a clean disposable pipette tip when sampling each hop oil to prevent cross contamination of HopInspiration® products and taste trial samples.
6. Close each flask, swirl to mix, and rest for 5 minutes.
7. Samples can be brought to taste panel directly or put into a chiller for up to three hours.
8. Conduct blind taste panel.
9. Use recorded preferences to make selections and calculate dosage rate for large-scale trials (**See Table 3.1 & Appendix B**).

**Table 3.1** Calculated actual hop oil in liters (column in green) vs. US beer in barrels (row in yellow) – EXAMPLE ONLY

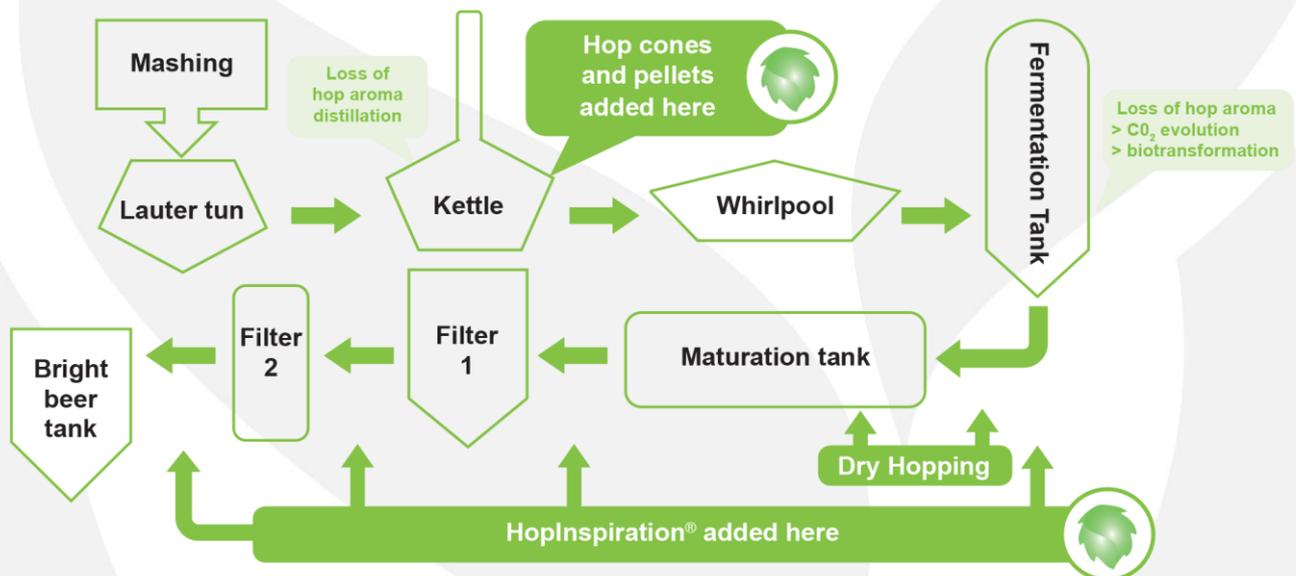
Oil, uL/200ml	50	75	100	125	150	175	200
10	0.29	0.44	0.59	0.73	0.88	1.03	1.17
30	0.88	1.32	1.76	2.20	2.64	3.08	3.52
50	1.47	2.20	2.93	3.67	4.40	5.13	5.87
70	2.05	3.08	4.11	5.13	6.16	7.19	8.21
90	2.64	3.96	5.28	6.60	7.92	9.24	10.56



### 3.3 Industrial Dosing Guidelines

The potential points of addition depend upon brewery configuration. The versatility of the HopInspiration® product line allows the brewer to be creative while collaborating with our team.

**Figure 3.1** Brewery process flow with recommended hop oil points of addition. It is optimum to dose the products as late in the process as possible, but feasibility is brew kit dependent.



#### Guidelines

- Ensure that all vessels, process lines, raw material and in-process beer surfaces are cleaned and sterilized appropriately.
- Oils can be added to fermenting or green beer depending on brewer preference and pre-determined target values (AE, ABV, etc.).
- Determine the expected volume of beer that requires hop oil additions, based upon actual or theoretical, calculated volumes. This should be the volume after yeast and fermentation solids have been removed.
- Calculate the volume of oil required based upon post-crop tank volume.



### Ideal dosing scenario

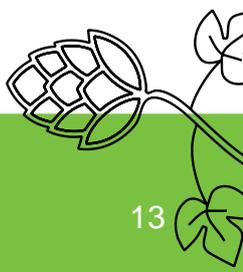
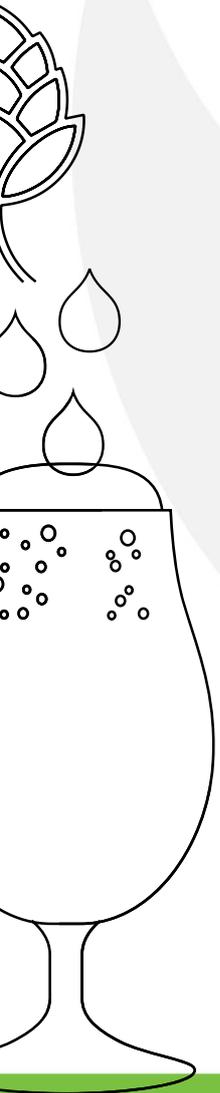
- a. A calibrated dosing system, alongside automatic carbonation, to inject the required oil volume inline to a beer Variable Frequency Drive (VFD) pump with meter for automated shut-off. This ensures that the proper oil volume is dosed, regardless of final tank volume.
- b. Allow beer to rest for 2 to 3 hours before conducting laboratory tests and taste conformance approval.

### If pumps are not available

1. Add the HopInspiration® product to the tank.
2. Purge the tank with CO<sub>2</sub> to reduce oxygen ingress.
3. Close tank and apply adequate pressure for carbonation.
4. Maintain tank pressure and temperature to achieve desired carbonation – this could take at least 4 hours, based upon the carbonation levels at the time of fill.
5. Conduct laboratory and taste conformance approval.

### Please note

- These are general guidelines and apply to fining, filtering, centrifuging, or transferring from tank to tank. Please contact us with personal questions and enquiries.
- Note that all GMP (Good Manufacturing Practice), Safety, Good Brewing Practice, HACCP, ISO certification, and other regulatory and policy practices independent for each operation are expected. Totally Natural Solutions does not assume any liability for incorporating this suggested operation practice (SOP).





## Appendix A



**Figure A.1** Examples of some of the equipment required for dosing trials. A) A plastic dropper pipette, B) An Erlenmeyer flask, and C) A micropipettor (requires plastic pipette tips).



## Appendix B

### Differential and preferential tasting sheet

#### Differential – Triangle Test

Instructions:

1. A triangle test requires a control, an undosed base beer, in addition to a dosed base beer with the desired HopInspiration® product.
2. For each panellist, label three plastic glasses with a three-number code. Fill two of the glasses with the control (undosed base beer) and the other glass with the test beer (base beer dosed with HopInspiration® product) (**Figure B.1**).
  - a. WRITE THESE CODES ON A SEPARATE SHEET FOR REFERENCE. This will prevent confusion and mixing of samples.
  - b. The sample numbering should be the same for each panellist.



**Figure B.1**

**Example of triangle test set-up. Note that the two non-starred cups are undosed base beer (387 and 425) and the cup with the red star (103) represents the dosed beer with the HopInspiration® product.**

3. Conduct a taste panel and provide panellists with a taster sheet similar to the example found below or utilise in-house sensory software.



### Triangle test example

Please mark identify the unique sample from the set of 3.

Sample #	Sample #	Sample #

Please mark identify the unique sample from the set of 3.

Sample #	Sample #	Sample #

Please mark identify the unique sample from the set of 3.

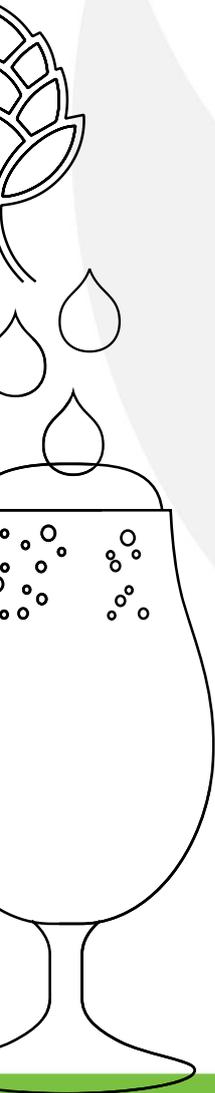
Sample #	Sample #	Sample #

Please mark identify the unique sample from the set of 3.

Sample #	Sample #	Sample #

Please mark identify the unique sample from the set of 3.

Sample #	Sample #	Sample #





## Master scoresheet example

Number of panellists: \_\_\_\_\_

Sample Code	Total Votes	Average (total votes/total panellists)*	Standard Deviation*

\*These values can be easily calculated using an excel spreadsheet

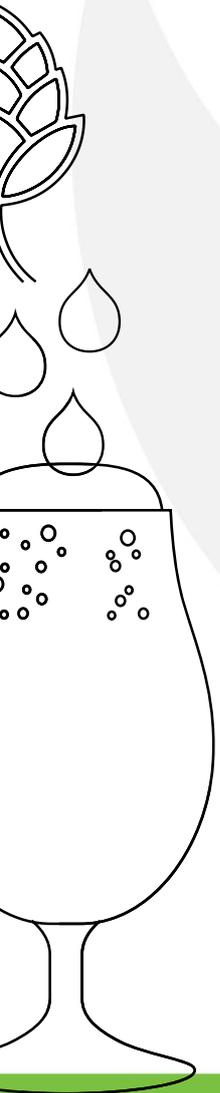
### Follow-up questions:

Could taste panellists detect a difference between dosed and undosed beer samples?

How many panellists detected the outlier?

Should the dose be scaled up or altered based upon the results?

Any additional notes/comments.

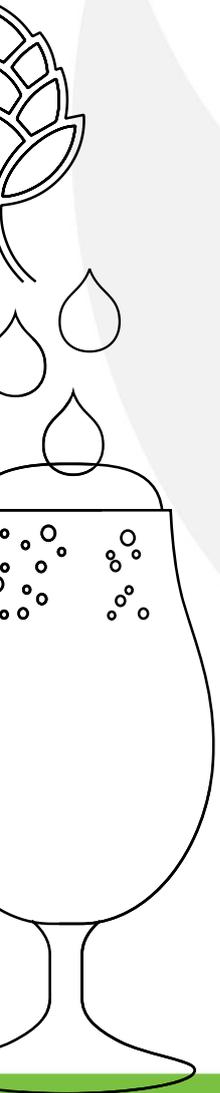




## Preferential – Rank Rating

### Instructions:

1. A rank rating test is designed for panellists to rank their personal sample preference from least to greatest or greatest to least.
2. Depending on personal preference, panellists can score each sample out of ten or score with fixed numbers (i.e.- Out of six samples, scoring the most preferred sample a '1' and the least preferred sample a '6').
3. As with the triangle test, label plastic glasses for each sample with a three-number code. If testing multiple dosages or products, it is recommended to include one control in the sample mix (undosed base beer).
  - a. WRITE THESE CODES ON A SEPARATE SHEET FOR REFERENCE. This will prevent confusion and mixing of samples.
  - b. The sample numbering should be the same for each panellist.
4. Conduct a taste panel and provide panellists with a taster sheet similar to the example found below or utilise in-house sensory software.





## Rank rating example

Score each beer according to preference (depending on preference, out of a fixed set or 1-10)

Sample	Score	Comments?

## Master scoresheet example

Number of panellists: \_\_\_\_\_

Sample	Highest Score	Lowest Score	Average Score

\*It is beneficial to assess the highest and the lowest score to cite discrepancies between panellists.

### Follow-up questions:

Were there any comments that were consistent? Were there comments of concern? Comments that stood out?

Which sample did panellists most prefer? What did the sample contain?

Which sample did panellists least prefer? What did the sample contain?

Should any doses be scaled up or altered based upon the results?

Any additional notes/comments.