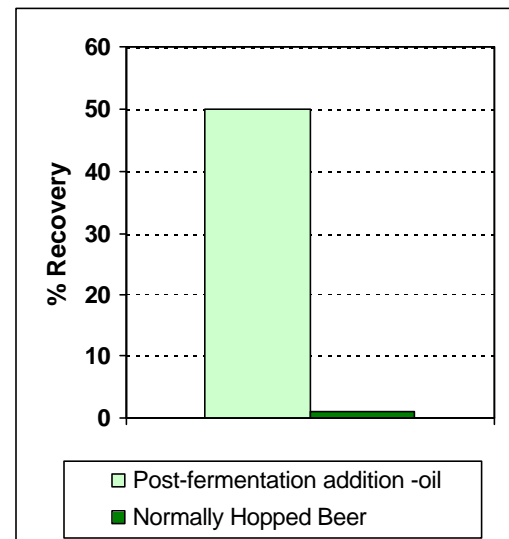


Hop Oil - Type *DRY*

❖ Overview

- **Hop Oil - Type *DRY*** is produced from leaf hops and contains the complete range of essential oils.
- **Hop Oil - Type *DRY*** can be dosed at several stages during the brewing process, resulting in improved oil recoveries compared to normal hopping techniques.
- **Hop Oil - Type *DRY*** produces pleasant hop aroma that can be subtly altered according to the manner of its use.

Recovery of Hop Aroma Material using Hop Oil Type *DRY* compared to Leaf Hops



❖ Specification

- **Description:** An almost colorless, clear liquid, containing the complete range of hop essential oils.
- **Iso-alpha-acids:** < 0.1 %
- **Alpha-acids:** < 0.1 %
- **Beta-acids:** < 0.1 %
- **Main essential oils:**

| | |
|----------------|----------------------------------|
| Myrcene: | 60 - 75 % (depending on variety) |
| Humulene: | 8 – 15 % (depending on variety) |
| Caryophyllene: | 4 – 7 % (depending on variety) |
- **Solvent residue:** Ethanol content < 2 %
- **Density:** Typically 0.8 g/ml

❖ Properties

□ Flavor:

Hop Oil - Type DRY can be used to provide a strong or, alternatively, a more subtle hop aroma depending on the quantity added, method and point of addition.

As well as aroma, **Hop Oil - Type DRY** also has an influence on total hop flavor. It is therefore very suitable for addition to lightstable beers in order to enhance hop character.

□ Recovery:

Depending on the time and method of addition, hop oil recoveries can range between 1 - 50% (see diagram). These figures are only valid when the hop oil is used according to the section entitled "Product Use".

□ Stability:

Hop Oil - Type DRY is stable for up to 12 months, when stored below 20°C. Opened containers should be used within a few weeks.

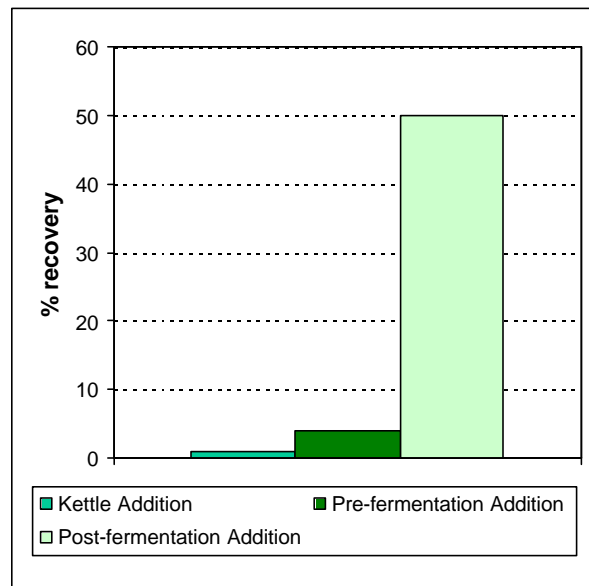
□ Quality:

All Hopsteiner® products are produced in plants accredited to internationally accepted quality standards.

❖ Packaging:

Hop Oil - Type DRY is usually packaged in aluminium bottles containing either 0.5kg or 1kg.

Recovery of Hop Aroma Compounds depending on Time of Addition of Hop Oil



❖ Product Use

- **Addition: Hop Oil - Type DRY** can be added at different stages during beer production:
 - **To the kettle:** results in low recoveries. Blending **Hop Oil - Type DRY** with a "carrier material", like beta acids, improves recoveries.
 - **Pre-fermentation:** the chemical reaction of volatile compounds during fermentation, combined with the modification of aroma compounds by yeast, can produce a more 'typical' or 'comparable' aroma.
 - **Post-fermentation:** direct addition prior to filtration, results in the hop oils dissolving unchanged into the beer.

For the latter two addition options **Hop Oil - Type DRY** should be diluted to 1% with ethanol.

□ Dosage:

The quantity of hop oil to be dosed depends on the method of addition:

- Kettle addition: 1 – 5 g per hl
- Pre-fermentation: 0.5 – 2 g per hl
- Post-fermentation: 0.05 – 0.2 g per hl

The above figures are indications only; actual additions will depend on the quality and strength of aroma required. Dosing experiments, using a microlitre syringe to inject oil into bright beer, will give useful indications of the target quantity required.

(Note: Where additions are made pre-fermentation, the influence of the fermentation conditions must be taken into consideration.)

□ Storage:

Hop Oil - Type DRY should be stored cold in screw top bottles. If cold storage is not possible, the temperature should not exceed 20°C. If aluminium bottles are not used, exposure to light must be avoided.

□ Safety:

No health hazards are known in normal use; non-toxic. If material comes into contact with the skin, wash off with soap and water. If material gets into the eyes, irrigate with excess water and seek medical attention. **Hop Oil - Type DRY** is a combustible material.

For full safety information please see the relevant Steiner material safety data sheet.

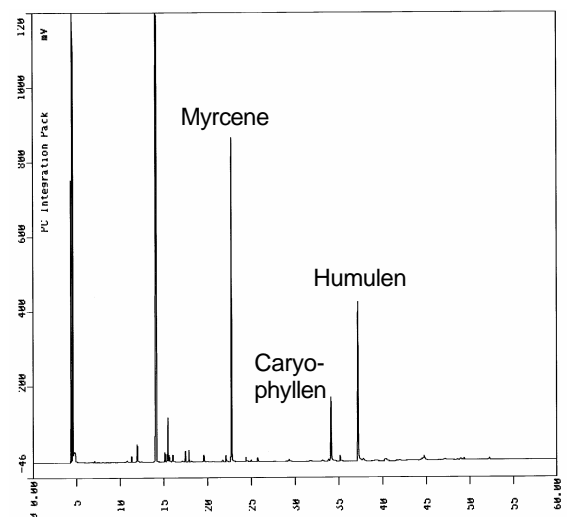
❖ Analytical Methods

□ Composition of hop oils:

For the analysis of individual hop oil components, gas chromatography techniques

are used. Details of methods are available on request from Steiner.

Typical Gas Chromatogram of Hop Oil – Type DRY



❖ Technical Support

We will be pleased to offer help and advice on the full range of Hopsteiner® products:

- Copies of all relevant analytical procedures
- Material Safety Data Sheets (MSDS)
- Assistance with pilot or full brewery trials
- Specialist analytical services

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