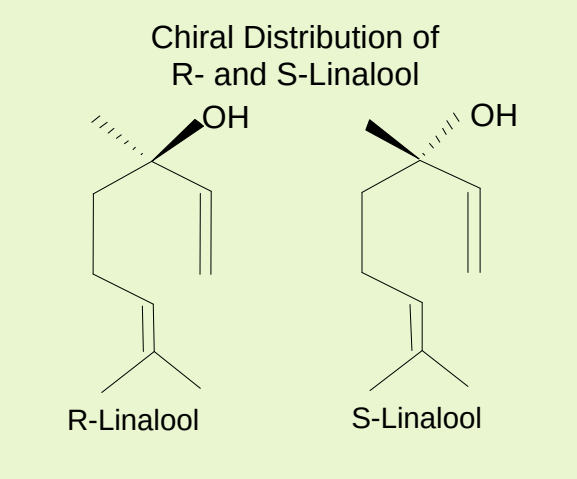
Hop Oil - Type NOBLE

❖ Overview

- **Hop Oil - Type NOBLE** is produced from leaf hops and contains the complete range of essential oils. However the more volatile, non-polar fraction is significantly reduced by a careful, further processing.
- **Hop Oil - Type NOBLE** has especially been developed for addition prior to filtration. Hop oil recovery is considerably improved compared to normal hopping techniques.
- **Hop Oil - Type NOBLE** provides a typical, pleasant flowery aroma in beer due to its special composition of aroma substances.



❖ Specification

• **Description:**	An almost colorless, clear liquid containing the essential hop oils required for achieving 'noble' hop character.	
• **Iso-alpha-acids:**	< 0.1 %	
• **Alpha-acids:**	< 0.1 %	
• **Beta-acids:**	< 0.1 %	
• **Main essential oils:**	Linalool:	8 – 15 %
• **Specific ratios:**	Linalool/Myrcene:	> 0.5
	Linalool/Caryophyllene:	> 5
	Linalool/Humulene:	> 3
	Linalool/Farnesene:	> 10
• **Chiral Distribution of Linalool:**	R – Linalool	92 % (more flavour active *)
	S – Linalool	8 %
• **Density:**	0.8 g/ml	

* Kaltner, D., Steinhaus, M., Mitter, W., Biendl, M., Schieberle, P.: R-linalool as key aroma component for the hoppy flavour in beer and its fate during beer production (in German). Monatsschrift für Brauwissenschaft, 11/12, 2003.

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❖ Properties

❑ Flavor

With reduced levels of the undesirable, volatile hydrocarbon fraction, **Hop Oil - Type NOBLE** produces a more subtle and pleasant hop aroma.
Furthermore **Hop Oil - Type NOBLE** has a little influence on beer bitterness. It is therefore very suitable for addition to light stable beers in order to enhance the typical hop character.

❑ Recovery

As **Hop Oil - Type NOBLE** contains less of the more volatile hop components, it shows better recovery than Hop Oil – Type *DRY*. Depending on the time of addition, hop oil recovery can range between 3 – 90 %. These figures are only valid if **Hop Oil - Type NOBLE** is used according to the recommendations in section “Product Use”.

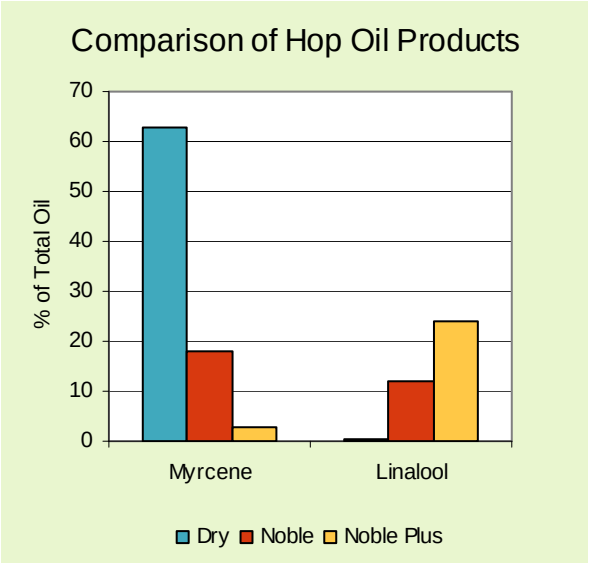
❑ Quality

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

❖ Packaging

Hop Oil - Type NOBLE is usually packaged in aluminium bottles containing either 0.5 or 1.0 kg.

Hop Oil - Type NOBLE can be delivered as pure hop oil or diluted with ethanol, ethanol / water and propylene glycol.



❖ Product Use

❑ Addition

Hop Oil - Type NOBLE can be added at different stages during beer production. However our recommendation is:

- **Post-fermentation:** Best recovery; direct addition into the beer stream prior to filtration results in hop oils dissolving unchanged into the beer.

The ideal time of addition of **Hop Oil - Type NOBLE** is prior to filtration.

❑ Dosage

Hop Oil - Type NOBLE is offered in **pure form**. The dosage concentration will be decided by the brewer and the quantity of hop oil to be dosed depends on the time and method of addition (**dilution** of pure hop oil in food grade ethanol **1 : 100** is recommended).

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The hop oil dosing should be based on Linalool:

- up to 20 µg/l: mainly hoppy, a bit herbal
- up to 60 µg/l: mild hoppy, herbal and flowery
- up to 100 µg/l: hoppy, herbal and flowery

The above figures are an indication 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.

Formula for hop oil dosage:

Desired linalool concentration in beer:	**DL [µg/l]**
Already available linalool concentration in beer:	**AL [µg/l]**
Linalool concentration in Type Noble:	**L [%]**
Utilization of linalool:	**U [%]**
Quantity (l) of beer:	**B [l]**
Quantity of hop oil:	**H [g]**

$$H = \frac{B \times (DL - AL)}{U \times L \times 1{,}000{,}000\ \mu g/g}$$

Example:

DL = 35 µg/l
AL = 8 µg/l
L = 12 %
U = 80 % *
B = 5,000 l
H = unknown

$$H = \frac{5{,}000\ l \times (35 - 8)\ \mu g/l}{80\% \times 12\% \times 1{,}000{,}000\ \mu g/g} = 1.41\ g$$

* can be different from brewery to brewery

❑ Storage

Hop Oil - Type NOBLE should be stored cold in screw top bottles. If cold storage is not possible, the storage temperature should not exceed 10°C (50°F). If aluminium bottles are not used, exposure to light must be avoided.

❑ Best Before

Hop Oil - Type NOBLE is stable 1 year from date of production.

❑ Safety

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.

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

❖ Analytical Methods

❑ Composition of Hop Oil - Type NOBLE

For the analysis of individual hop oil components, gas chromatography techniques are used. Details of methods are available on request from Steiner.

❖ 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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