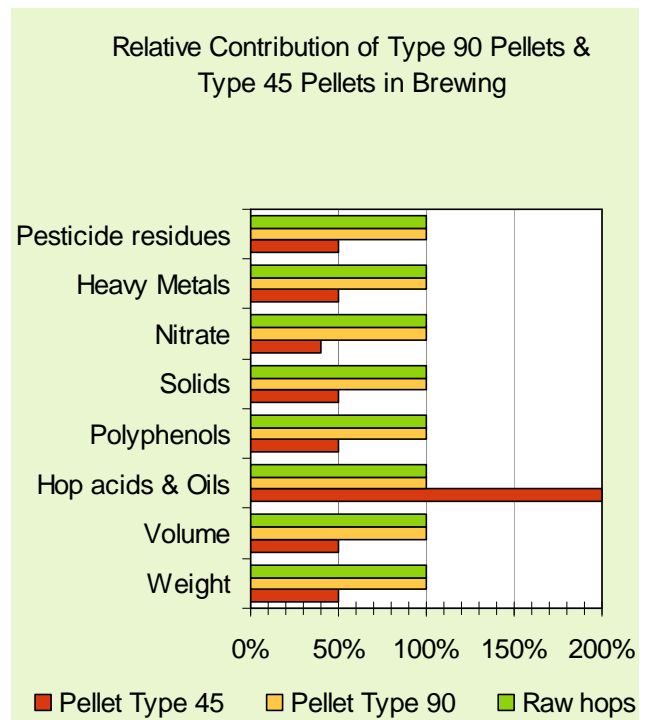


## Type 45 Pellets (Concentrated Pellets)

### ❖ Overview

- **Type 45 Pellets** are a kettle-added hop product providing bitterness and hop aroma.
- In **Type 45 Pellets** the hop bitter acids and essential oils are concentrated by the removal of some of the non-essential plant material during processing.
- **Type 45 Pellets** provide improved utilization, more homogeneity, better storage stability and significantly reduced transport / storage costs compared to raw hops.



### ❖ Specification

- **Description:** Free flowing, cylindrical pellets made from whole hops which are dried, milled and compressed; during processing the lupulin glands are concentrated by the removal of part of the plant cellulose, lignin etc.
- **Consistency:** A solid which normally breaks up into a powder (depending on variety)
- **Color:** Typically olive-green (depending on variety)
- **Alpha-acids:** Typically 4 – 20 %  $\alpha$ -acid (depending on variety)
- **Beta-acids:** Typically 2 – 15 %  $\beta$ -acid (depending on variety)
- **Hop oils:** Typically 2 – 6 % of product (depending on variety)
- **Moisture:** Typically 7 – 9 %

PDS 02/07 issued 05/2009

## ❖ Properties

### □ Appearance

Olive-green pellets approximately 6 mm x 10 – 15 mm in size (diameter x length); pellets should be smooth but not dark and 'glassy' in appearance.

### □ Utilization

Added early in the boil (up to 15 mins. after start) utilization in the range 30 % - 35 % is normally achieved. When **Type 45 Pellets** are added late in the boil utilization can reduce to 20 % or less, depending on the specific process conditions. Late addition increases the hop character of the resultant beer.

### □ Flavor

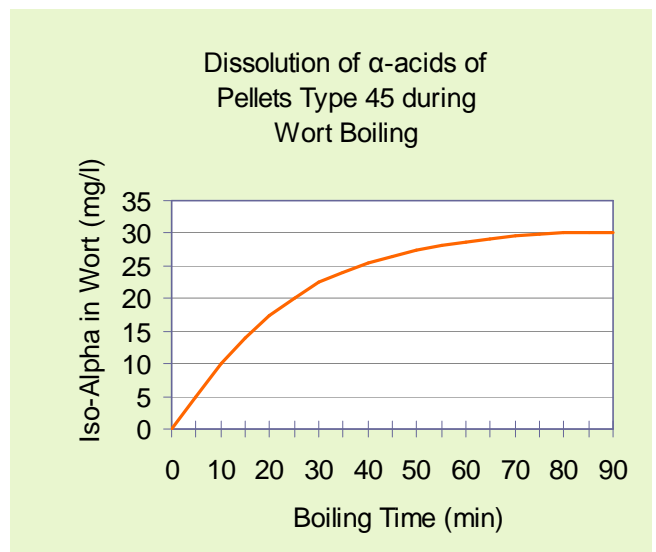
**Type 45 Pellets** can produce beer flavor indistinguishable from that produced from leaf hops.

### □ Quality

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

## ❖ Packaging

**Type 45 Pellets** are normally packed in laminated foils within cartons either as 'hard' packs under vacuum or as 'soft' packs under inert gas (N<sub>2</sub> and / or CO<sub>2</sub>) at atmospheric pressure. Pack sizes range from 2 kg (4.5 lbs) to 150 kg (330 lbs); normally 20 kgs (44 lbs) in the US.



## ❖ Product Use

**Type 45 Pellets** are used in similar ways to raw hops contributing bitterness and aroma character to beer.

### □ Dosage

The quantity of pellets to be added can be calculated using the pellet  $\alpha$ -acid content and an estimated utilization of 30 – 35 %. To establish the impact on beer aroma, trial brews are recommended as the quantity and quality of hop oil will vary between varieties.

### □ Addition

**Type 45 Pellets** can be manually weighed and added directly to the kettle. Alternatively the addition of **Type 45 Pellets** can be automated with the attendant labor saving benefits.

### □ Storage

**Type 45 Pellets** should be cool stored at < 5°C (41°F). Opened foils/cartons should be used quickly to avoid deterioration of the bitter acids and essential oils.

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## ❑ **Best Before Date**

**Type 45 Pellets** are stable 2 years from date of production under the recommended storage conditions.

## ❑ **Safety**

If dust is generated, it is advisable to wear a dust mask. Hop pellets are a combustible material.

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

## ❖ **Analytical Methods**

### ❑ **Concentrations of $\alpha$ - and $\beta$ -acids:**

$\alpha$ - and  $\beta$ -acids can be measured by any of the following:

- ASBC Spectrophotometric method (Hops-6) - ( $\alpha$ - and  $\beta$ -acids)
- IOB method 6.4 ( $\alpha$ -acid, conductometric)
- EBC method 7.5 ( $\alpha$ -acid, conductometric)
- By HPLC, using the current ICE standard, according to the EBC 7.7 method, IOB method 6.5 or the ASBC method (Hops-14) - ( $\alpha$ - and  $\beta$ -acids)

## ❑ **Concentrations of Hop oils**

Hop oil concentration can be measured by the following methods:

- IOB 6.3 method
- ASBC hops-13

## ❑ **Standardization**

The concentration of the  $\alpha$ -acid content in **Type 45 Pellets** can be standardized to specified levels during pellet production.

## ❖ **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