



# HVG – Lupulin Enriched Pellets (Pellets Type 45)

## Product Specification

### Manufacturer

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Supplier:

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The HVG-Lupulin Enriched Pellets contain the natural substances of the flower of the hops plant (*humulus lupulus*) in their chemical unchanged form.

The HVG- Lupulin Enriched Pellets contain the aromatic substances of the hops (hop oils), the polyphenols and the bittering resins (humulones and lupulones), which are dependent on the hop variety and crop singularities as well as on the concentration factor of the pellets.

According to the EBC (European brewery convention) Manual of good practice for Hops and Hop Products (ISBN3-418-00758-9) the process of producing pellets out of the hops is the following:

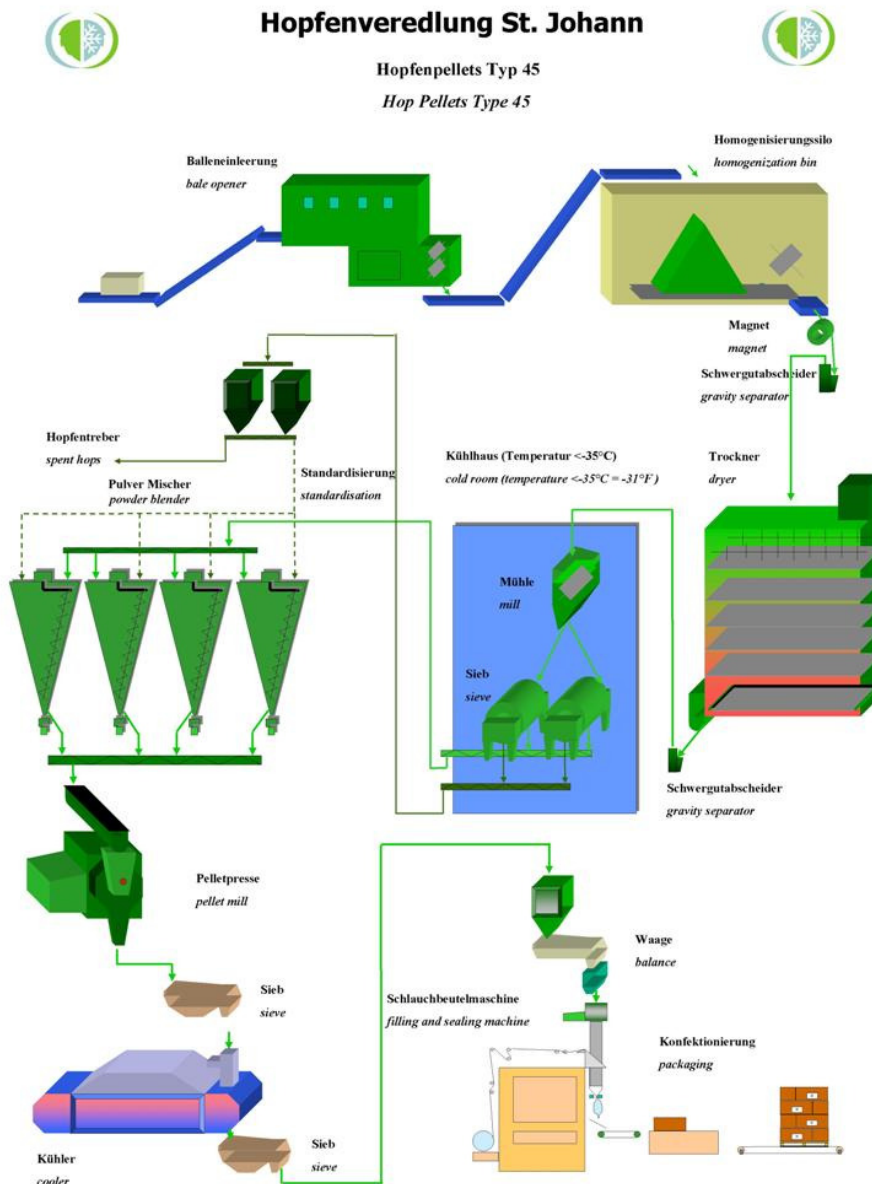
1. Elimination of extraneous matter, metals as well as leaf and stem.
2. Additional drying to a residual moisture content of about 8% to 10% w/w
3. Freezing to -32°C
4. Crushing in hammer mills
5. Homogenisation
6. Sieving
7. Pelleting in ring dies
8. Cooling of pellets
9. Packing excluding atmospheric oxygen



## Utilisation of HVG-Lupulin Enriched Pellets

Like the hop flowers, the HVG-Lupulin Enriched Pellets are used as a natural flavouring ingredient in the process of beer brewing. The pellets are dosed during the process of wort boiling in order to achieve the isomerisation of the humulones (alpha-acids) to iso-humulones (iso alpha acids)

## Production Flowsheet





- First homogenisation step thru initial distribution of hop lots by batches.
- In the homogenisation silo the leaf hops batch is prepared for cleaning and milling.
- Cleaning by means of pneumatic separators and metal detectors
- The drying temperature should be limited to a maximum of 60°C and moisture should not be lower than 8% w/w
- Freezing to -30°C to -35°C
- Hammer milling to produce powder
- Sieving to separate leaf fraction from the hop cones.
- Powder homogenisation in conical blenders
- Pelleting not exceeding a pellet temperature of 55°C to a density of about 500 kg/m<sup>3</sup>
- Cooling below 20°C
- Packing under inert atmosphere of gas blend between N<sub>2</sub> and CO<sub>2</sub>

### Typical characterisation of HVG-Lupulin Enriched Pellets

$\alpha$  – acids (resins):                    between 6% to 20% w/w dependent on the hop variety  
 $\beta$  – acids (resins):                    between 6% to 15% w/w dependent on the hop variety  
essential oils:                            up to 4,0 ml/ 100 g                    dependent on the hop variety

Appearance:                            Dull green with a typical hop aroma  
Density:                                    from 480- 550 kg / m<sup>3</sup>

### Storage / Stability

Brewing constituents are best protected by storing cold at 1 °C to 5 °C. Out of quality reasons HVG-Lupulin Enriched Pellets should be used as soon as possible after opening the packaging. Hop constituents oxidise in contact with air, no hazardous reactivity known. Recommended storing conditions to avoid analytical measurable degradation of bittering constituents:

at 10 - 15 °C:                            up to 2 years  
at 0 - 5 °C:                                up to 5 years

No special precautions necessary.

### Health and Safety

Use protective mask where dust is generated. See MSDS.

### Packing and Dosage

HVG-Lupulin Enriched Pellets are packed in aluminium laminated foils under inert atmosphere in corrugated cardboard cartons. The foil size is ranging from 2,0 Kg to 20,0 Kg net pellets weight. Larger packing volumes, e.g. 140 Kilo Zewatheners are available for use with automatic dosing units.



Hops in the brew-house: traditionally the hopping takes place in the wort copper. The time for the dosage varies from the first-wort hopping, via the additions directly before casting, up to direct aroma hopping in the whirlpool. After being dosed the hop components pass through the following stages:

- mechanical distribution
- emulgation i.e. dissolving the components
- components are transformed by heat
- evaporating volatile (partly undesired) hop oils
- partially combining with proteins and precipitation

At the same time the following processes occur during the wort boil:

- Bitter substances: alpha isomerises to iso-alpha-acid, dissolving other components of the resin fraction like the humulinic acids
- Dissolution and polymerization of polyphenols
- Aroma substances: dissolving, evaporation, oxidation

### Yield of bitter substances

In the brewery the yield results from the ratio between the remaining bitter substances in the finished beer and the bitter substances dosed with the hops according to the following rule:

$$\text{Yield} = \frac{\text{bitter compounds in the finished beer}}{\text{bitter hops dosed in hops}} \times 100$$

and is calculated as the isomerisation rate as follows:

$$\text{Rate of isomerisation} = \frac{\text{iso-alpha-acids in wort or beer}}{\text{alpha-acids dosed}} \times 100$$

Utilisation of the alpha acids as early addition to the kettle is in the range of 25% to 45%, typically 35%.

HVG-Lupulin Enriched Pellets can be used as single hop addition or in combination with hops extract.



## **Analytical Methods**

For hop pellets the following analysis methods can be applied to measure the alpha and beta acids:

EBC 7.5 Bitter Substances in Hops and hop products: Lead conductance value  
EBC 7.7 Alpha and beta acids in Hops and Hop Products by HPLC (ASBC Hops-14)  
EBC 7.8 Iso-alpha, alpha and beta acids in Hops and Hop Products by HPLC  
ASBC Hops-6 Spectrophotometric method

Hop oil concentration can be measured by:

- EBC 7.10
- ASBC Hops-13

## **Other information**

The product is accompanied by the Phytosanitary certificate, which states that the product has been produced according to the national health regulations.

The above information is based on the current state of knowledge of our product at the time of publication and is furnished without warranty of any kind. The user must satisfy himself that the product is entirely suitable for his purposes.

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