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Brennereitechnologie

Preparation of potato mashes for the distillation of potato spirits

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page 1/2

Technical informations and use instructions

General:

Potatoes contain 12-21 % of starch. This amount corresponds to yields between 8 and 13 liters of pure ethanol per 100 kg of potatoes.

The preparation of mashes from potatoes for the production of spirits has the purpose to gelatinize, liquefy and saccharify the starch contained completely to the fermentable sugars glucose and maltose. Starch which resists the mashing and fermentation process without any degradation, will not only cause problems as strong foaming during fermentation and encrustations during distillation but also low yields of ethanol.

In the scale of small distilleries only **pressure-less processes** for the degradation of the starch are applicable. Fine grinding (hammer mill fitted with a 1,5 to 2 mm slot screen) of the raw potatoes (or alternatively: pumping of previously cooked potatoes through an eccentric spiral pump) is an important precondition for the disintegration of the plant cells, the release of the starch and the success of the following mashing process.

A further important precondition for complete ethanol yields and for the quality of the potable spirits is to prevent mashes from bacterial spoilage. To achieve this the raw potatoes have to be cleaned thoroughly by washing and the mash has to be artificially acidified after the liquefaction rest.

For grains widely used **processes at saccharification temperature** (55-60°C) with barley malt as single source of amylolytic enzymes are not applicable to potatoes without big losses of ethanol yield.

In contrast the high gelatinization temperature of potato starch requires a **process at liquefaction temperature of 90-95°C**.

The gelatinization of the starch (solubilization in hot water) is precondition for its subsequent enzymatic degradation to dextrans by thermostable bacterial amylases (liquefaction) and for the subsequent saccharification of the liquefied starch (dextrans) by fungal amylases and / or malt.

Products for the process at gelatinization temperature:

- **SCHLIESSMANN -VF-Kartoffel-**

This thermostable bacterial α -amylase allows the enzymatic degradation of gelatinized starch at temperatures of 90 to 95°C (potatoes, maize, corn).

- **SCHLIESSMANN -VZ-**

This combination of fungal α - and glucoamylase allows the enzymatic breakdown of dextrans (liquefied starch) to fermentable sugars. It may be used to replace or supplement diastatic green or kiln-dried barley malts.

- **SCHLIESSMANN -EX-Protin-**

This fungal protease allows the enzymatic breakdown of proteins in potatoe mashes, which would lead to foaming during fermentation and distillation, to fouling of the cooling coil and to encrustations in the mash tub and the distillation apparatus.

- **Kornbrand "premium"**

As mashes from starchy raw materials are prepared by heating, they have to be inoculated by a strong fermenting yeast strain to achieve the alcoholic fermentation rapidly and completely. This strain of distillers active dried yeast will tolerate at least 15%vol and nearly 40°C.

Mashing process for potatoes:

- Pour cooking water into the mash tub. The volume depends on the starch content of the potatoes and the viscosity of the ground potatoes during the following heating up. The saccharified mash at the end of the mashing process should show an extract of 16-18° Brix.
- Grind thoroughly cleaned raw potatoes by a hammer mill or pump previously cooked potatoes through an eccentric spiral pump into the mash tub.
- After having transferred 10% of the potatoes into the mash tub add **SCHLIESSMANN -VF-Kartoffel** (5-6 ml/100 kg potatoes) for the enzymatic liquefaction of the starch.

The pH should be between 5,5 and 6; lower pH-values have to be increased by the addition of potassium carbonate.

- Heat the mash to gelatinization / liquefaction temperature (at least 90°C) with live steam or an immersion coil while stirring.
- Keep a liquefaction rest for at least 30 minutes while stirring.
- Cool down the liquefied mash to 55°C by using a cooling coil while stirring.
- Adjust the pH to 4,5 to 5,0 by adding sulphuric acid (around 30-40 ml/100 l mash; sulphuric acid has previously to be diluted by careful pouring it into the tenfold volume of cold water).
- Add **SCHLIESSMANN -VZ-** (18 ml/100 kg potatoes) for the enzymatic saccharification of the dextrans.
- Add **SCHLIESSMANN -EX-Protin-** (12 ml/100 kg potatoes) for the enzymatic degradation of protein.
- Continue cooling down to inoculation temperature (25 to 28°C) by a cooling coil or direct addition of cold water.
- Inoculate the mash with a freshly prepared suspension of **Kornbrand "premium"** 20-35 g / 100 kg potatoes, rehydrated 10 minutes ago with warm water.
- To prevent foaming add **SILICON Antischaum US** (3-5 g/100 kg potatoes).
- The mash should be completely fermented during 3-4 days. The apparent extract in the filtrate of the fermented mash should not exceed 1-1,5° Brix.

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