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Tel. 07 91 - 9 71 91-0 • Fax 9 71 91-25  
C. Schliessmann Kellerei-Chemie GmbH & Co.KG  
Auwiesenstr. 5 • D-74523 Schwäbisch Hall

Brennereitechnologie

## Preparation of grain mashes for the distillation of grain spirits

version 01/2011

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### Technical informations and use instructions

#### General:

The preparation of mashes from starchy raw materials for the production of grain 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 lower yields of ethanol.

In the scale of small distilleries only **pressure-less processes** for the degradation of the starch are applicable. Fine milling (hammer mill fitted with a 1,5mm screen) of the raw material is an important precondition for the complete release of the starch granules from the grains and the success of the following mashing process.

In the past widely used **processes at saccharification temperature** (55-60 °C) with barley malt as single source of amylolytic enzymes may be successful in the case of grains with high autoamylolytic enzymatic activities and low gelatinization temperature (f.e. wheat and barley malts, triticale). But they bear the risks of incomplete gelatinization of the starch and bacterial infections of the mashes and therefore losses of ethanol.

This is the reason to prefer mashing **processes at gelatinization temperature** (wheat, rye: 65-70 °C, corn / maize: 80-90 °C). Gelatinization of the starch (solubilization in hot water) is precondition for its following enzymatic degradation. These processes use thermostable bacterial enzymes for the simultaneous liquefaction of the gelatinized starch and fungal amylases and / or malt for the saccharification of the liquefied starch (dextrins).

#### Products for the process at gelatinization temperature:

- **SCHLIESSMANN -VF-**

This thermostable bacterial  $\alpha$ -amylase allows the enzymatic degradation of gelatinized starch at temperatures of 75 to 80 °C (wheat, rye, barley, oats, triticale).

- **SCHLIESSMANN -VF- Kartoffel-**

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

- **SCHLIESSMANN -VZ-**

This combination of fungal  $\alpha$ - and glucoamylase allows the enzymatic breakdown of dextrins (liquefied starch) to fermentable sugars. It may be used to replace or supplement diastatic malts.

- **SCHLIESSMANN -EX-Protin-**

This fungal protease allows the enzymatic breakdown of proteins in wheat, which would lead to foaming and encrustations.

- **SCHLIESSMANN -EX-Tosan-**

This combination of fungal pentosanase and  $\beta$ -glucanase prevents foams and high viscosities in mashes from rye, barley and oats.

- **Kornbrand "premium" / Whiskey "select"-**

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. These two strains of distillers active dried yeast are tolerant until at least 15%vol and nearly 40 °C.

### Mashing process for distilleries without device for heating up the mash:

- Pour hot water (85-90°C, around the 3-4fold weight of grain to be processed) into the mash tub.  
☞ **for maize / corn: cooking water**
- Add **SCHLIESSMANN-VF-** (20 ml/100kg grain) simultaneously with the whole-grain meal by vigorous stirring.  
☞ **for maize / corn: VF-Kartoffel**
- If available, add diastatic kiln-dried malt meal to support the enzymatic decrease of high viscosities (around 10 % of the weight of processed raw grain).
- Measure the temperature. It has to be some degrees above the gelatinization temperature, at least at 70°C.  
☞ **for maize / corn: at least 90°C**
- Keep a liquefaction rest for at least 30 minutes while stirring.
- Cool down the liquefied mash to 55°C by using a cooling coil.
- Adjust the pH to 4,5 to 5,0 by adding sulphuric acid (around 50 ml / 100 l mash; sulphuric acid has previously to be diluted by careful pouring it into the tenfold volume of cold water).
- Add diastatic kiln-dried malt meal and / or **SCHLIESSMANN-VZ-** (50-60 ml/100 kg grain)
- For wheat: add **SCHLIESSMANN-EX-Protin-** (15ml/100kg wheat)
- For barley / rye / oats: add **SCHLIESSMANN-EX-Tosan-** (15-20 ml/100 kg rye, barley or oats)
- Continue cooling down to inoculation temperature (25 to 28°C) by cooling coil or direct addition of cold water.
- Inoculate the mash with freshly prepared suspension of **Kornbrand "premium"** or **Whiskey "select"**, 75-100 g/100 kg grain, rehydrated 10 minutes ago with warm water.

### Mashing process for distilleries with devices for heating up the mash:

- Pour warm water (max. 60°C, around the 3-4fold weight of grain to be processed) into the mash tub.
- Add **SCHLIESSMANN-VF-** (20 ml/100 kg grain) simultaneously with the whole-grain meal by vigorous stirring.  
☞ **for maize / corn: VF-Kartoffel**
- If available, add diastatic kiln-dried malt meal to support the enzymatic decrease of high viscosities (around 10 % of the weight of processed raw grain).
- Heat the mash to gelatinization temperature (at least 75°C) with live steam or an immersion coil.  
☞ **for maize / corn: at least 90°C**
- Keep a liquefaction rest for at least 30 minutes while stirring.
- Cool down the liquefied mash to 55°C by using a cooling coil.
- Adjust the pH to 4,5 to 5,0 by adding sulphuric acid (around 50 ml / 100 l mash; sulphuric acid has previously to be diluted by careful pouring it into the tenfold volume of cold water).
- Add diastatic kiln-dried malt meal and / or **SCHLIESSMANN-VZ-** (50-60 ml/100 kg grain).
- For wheat: add **SCHLIESSMANN-EX-Protin-** (15 ml/100 kg wheat).
- For barley / rye / oats: add **SCHLIESSMANN-EX-Tosan-** (15-20 ml/100 kg rye, barley or oats).
- Continue cooling down to inoculation temperature (25 to 28°C) by cooling coil or direct addition of cold water.
- Inoculate the mash with freshly prepared suspension of **Kornbrand "premium"** or **Whiskey "select"**, 75-100 g/100 kg grain, rehydrated 10 minutes ago with warm water.