Evaporation plant for the starch industry

Starch products from corn, grain, potato and tapioca

GEA engineering for a better world

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Evaporation technology in the starch industry

GEA delivers plant with plate, shell and tube evaporators for multiple applications in the starch industry.

Thanks to extensive know-how, numerous investigations in the GEA research and development center and the experience gained during many diverse installation projects, GEA is able to offer tailor-made plant concepts that meet the individual requirements of our customers.

GEA has a comprehensive portfolio of machinery, equipment and know-how to configure and install fully integrated manufacturing lines for starch products. In addition to evaporation plant, GEA supplies technologies for agglomeration, crystallization, starch and gluten separation, dewatering and drying.

Fields of application for evaporation plants in the starch industry
- Steep water and washing water
- Thin juices
- Glucose
- Fructose
- Dextrose
- Maltose
- Sorbitol

Raw substances for starch production
- Corn
- Wheat
- Rye
- Triticale
- Rice
- Potato
- Tapioca
- Millet
A significant amount of information is required and many marginal conditions have to be taken into account to find the best solution for each application. Taking into consideration the following aspects, GEA will offer the best plant design for each customer:

**Product-specific parameters**
- Initial concentration and final concentration
- Max. permissible product temperature
- Residence time
- Portion of dissolved and undissolved solid matter
- Viscosity
- Boiling point shift
- Purity of the feed product
- Operating time between cleaning cycles
- Liquid distribution in the evaporator adjusted to the product

For an economically designed evaporation plant, investment and operating costs, have to be taken into account. Moreover, the energy situation of the complete factory has to be considered.
Energy saving options

• Heating by means of exhaust heat (e.g. dryer exhaust steam)
• Multi-effect evaporation
• Thermal vapor recompression
• Mechanical vapor recompression

GEA checks the customer’s energy situation prior to designing the plant to be able to offer the best solution. Plant designed by GEA represent the highest quality and cost effectiveness. We strictly observe all criteria with regard to the specific process requirements, and make reliability and ease of operation an absolute priority.

GEA means

• Experience gained during more than 100 years of evaporator technology and with more than 4,000 successful projects all over the world
• Extensive product knowledge
• Reliable and easy-to-operate plant
• Short plant commissioning periods
• Numerous patents in Germany and abroad
• An internal R&D center with lab-scale pilot plant
• Worldwide distribution network
• Certification according to DIN EN ISO 9001
Treatment of process effluents in the starch industry

Water flows
During the production of starch, different process waters are produced when decomposing the raw substances. These steep waters and washing waters contain valuable nutrients such as proteins and lactic acid.

Concentration
To recover these nutrients, the water is concentrated in the evaporation plant.

<table>
<thead>
<tr>
<th>Concentrations achievable in evaporation</th>
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<tr>
<td>Corn steep water</td>
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<tr>
<td>Washing water from wheat starch production</td>
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<tr>
<td>Potato fruit water</td>
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The achievable final concentrations depend on the production process and on the mechanical and enzymatic pretreatment.

Use of the concentrate
- Valuable fodder addition
- Fertilizers
- Agars for the production of antibiotics
- Raw substances for alcohol production

Types of evaporators
- Falling film evaporator
- Forced circulation evaporator

Heating by means of
- Dryer exhaust steam
- Mechanical vapor recompression
- Thermal vapor recompression
- Steam
Concentration of potato fruit water

An evaporation plant for the concentration of potato fruit water, comprising two identical lines that each has a single-effect, falling film evaporator as a pre-evaporator, heated by a mechanical, vapor recompressor, as well as a 3-effect falling film forced circulation finisher, heated using a thermal vapor recompressor.

Overall evaporation rate: 152,000 kg/h.
Concentration of effluents from wheat starch

Evaporation plant for the concentration of waste water and effluents from wheat starch production, heated by a mechanical vapor recompressor.

Evaporation rate: 30,000 kg/h.

GeA evaporation

GeA equipment
Concentration of corn steep water

Evaporation plant for the concentration of corn steep water. Comprising a 3-effect falling film, forced circulation evaporator with vapor scrubber and heated using dryer exhaust steam.

Evaporation rate: 20,000 kg/h.
Concentration of starch saccharification products

In the preparation of starch saccharification products, thin juices of different degrees of saccharification and concentration are produced from which fats or lipids and proteins are separated and subsequently concentrated in the evaporation plant. The amount of degradation in the basic D-glucose molecule is indicated by its DE value. The higher the DE value, the greater the proportion of D-glucose molecules compared with its dry weight. GEA has the product know-how to supply evaporation plant for different DE values and saccharification products.

- Dextrose (pure D-glucose, DE > 90)
- Glucose syrup (DE 20 to DE 65)
- Maltodextrin (DE 3 to DE 20)
- Maltose syrup
- Isoglucose syrup (fructose 42, 55 or 70, the figure describes the fructose content)
- Sorbitol (derived from D-glucose)
- Mannitol (derived from D-glucose)

GEA uses the following evaporator types for concentration
- Falling film evaporator
- Plate evaporator

Heated by:
- Mechanical vapor recompression
- Thermal vapor recompression
- Steam
- Dryer exhaust steam
A single-effect falling film evaporation plant with two parallel, multi-path calandria (for two different starch hydrolysates), heated using a common mechanical vapor recompressor.

Evaporation rate: 22,000 kg/h.
Sorbitol

A 2-effect plate evaporation plant, heated using a thermal vapor recompressor, to process sorbitol solutions.

Evaporation rate: 4,300 kg/h.
Glucose

A 2-effect falling film evaporation plant with mechanical vapor recompression and a single-effect falling film evaporator (finisher) with a thermal vapor compressor and a vacuum cooler for glucose DE30–DE55.

Evaporation rate: 49,300 kg/h.
A directly heated, co-current, 3-effect plate evaporation plant with a downstream vacuum cooler to concentrate glucose syrup.

Evaporation rate: 25,000 kg/h.
We live our values.
Excellence • Passion • Integrity • Responsibility • GEA-verity

GEA is a global technology company with multi-billion euro sales operations in more than 50 countries. Founded in 1881 the company is one of the largest providers of innovative equipment and process technology. GEA is listed in the STOXX® Europe 600 Index. In addition, the company is included in selected MSCI Global Sustainability Indexes.