

# Evaporation Plants for the Starch Industry

Starch Products from Corn, Grain, Potato, Tapioca





# Evaporation Technology in the Starch Industry

GEA Wiegand delivers plants with plate and shell and tube evaporators for multiple applications in the starch industry. Thanks to extensive know-how, numerous investigations in the GEA Wiegand research and development centre and thanks to the experience gained by thousands of evaporation plants GEA Wiegand is able to offer tailor-made plant conceptions meeting the individual requirements of our customers. Our scope of supply and services includes consulting, engineering, calculation, design, manufacture, delivery, quality control, commissioning and after-sales service, plant expansion and energy optimization.

## FIELDS OF APPLICATION FOR EVAPORATION PLANTS IN THE STARCH INDUSTRY

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- Steep water and washing water
  - Thin juices
  - Glucose
  - Fructose
  - Dextrose
  - Maltose
  - Sorbitol
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## RAW SUBSTANCES FOR STARCH PRODUCTION

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- Corn
  - Wheat
  - Rye
  - Triticale
  - Rice
  - Potato
  - Tapioca
  - Millet
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## Selection of evaporator types and plant arrangements

Numerous information are required and many marginal conditions have to be taken into account in order to find the best solution for each application. Taking into consideration the following aspects, GEA Wiegand will offer the best plant design for each customer:

### PRODUCT-SPECIFIC PARAMETERS

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- Initial concentration and final concentration
  - Max. permissible product temperature
  - Residence time
  - Portion of dissolved and undissolved solid matters
  - Viscosity
  - Boiling point shift
  - Purity of the feed product
  - Operating time between cleaning cycles
  - Liquid distribution in the evaporator adjusted to the product
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For an economic design of the evaporation plant, the investment costs and the running operating costs, i. e. overall energy costs, have to be taken into account. Moreover, the energy situation of the complete factory has to be considered.

### ENERGY SAVING OPTIONS

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- Heating by means of exhaust heat (e. g. dryer exhaust steam)
  - Multi-effect evaporation
  - Thermal vapour recompression
  - Mechanical vapour recompression
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GEA Wiegand checks the customer's energy situation prior to designing the plant in order to be able to offer the best solution. Plants designed by GEA Wiegand stand out for highest quality and cost effectiveness. We strictly observe all criteria with regard to the process-technological requirements, and we set extreme importance on reliability and ease of operation.

### GEA WIEGAND MEANS

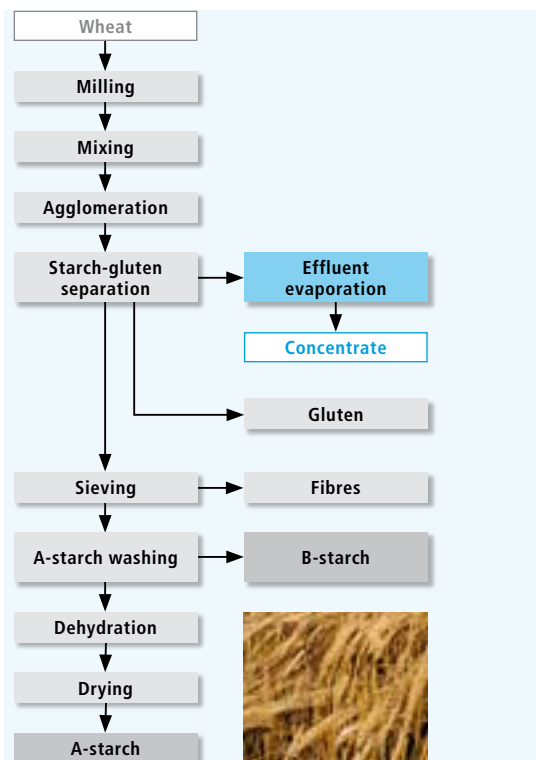
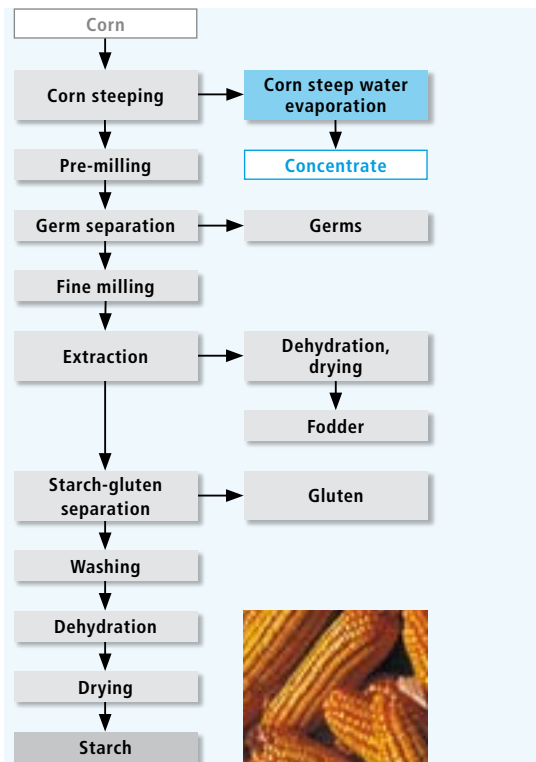
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- Experience gained during more than 100 years of evaporator technology and with more than 4000 plants delivered all over the world
  - Extensive product knowledge
  - Reliable and easy-to-operate plants
  - Short plant commissioning periods
  - Numerous patents in Germany and abroad
  - Company-internal research and development centre with pilot plants in laboratory scale
  - Worldwide distribution network
  - Certification according to DIN EN ISO 9001
  - Member of the internationally operating GEA Group
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# Treatment of Process Effluents in the Starch Industry

## Production of starch from grain



**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.

### WATER FLOWS OCCURRING DURING THE PROCESSING OF THE RAW SUBSTANCES

- Steep water
- Washing water

### VALUABLE NUTRIENTS

- Protein
- Lactic acid

**CONCENTRATION.** To recover these nutrients, the water is concentrated in evaporation plants.

### CONCENTRATIONS ACHIEVABLE IN EVAPORATION

- Corn steep water: 50 – 55 % DS
- Washing water from wheat starch production: 25 – 40 % DS
- Potato fruit water: 60 – 70 % DS

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 the alcohol production

### TYPES OF EVAPORATORS

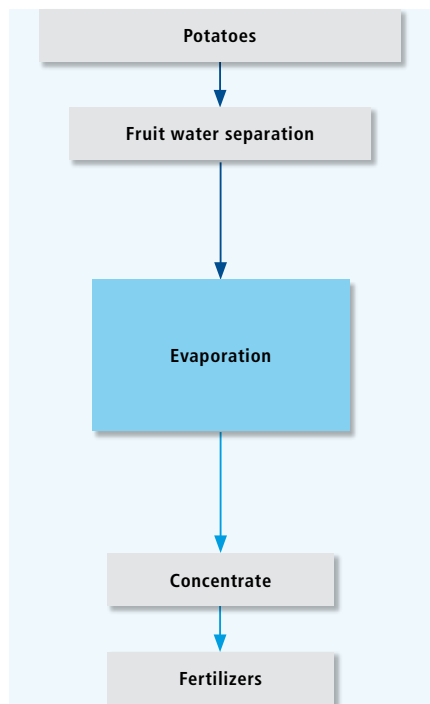
- Falling film evaporator
- Forced circulation evaporator

Heating by means of:

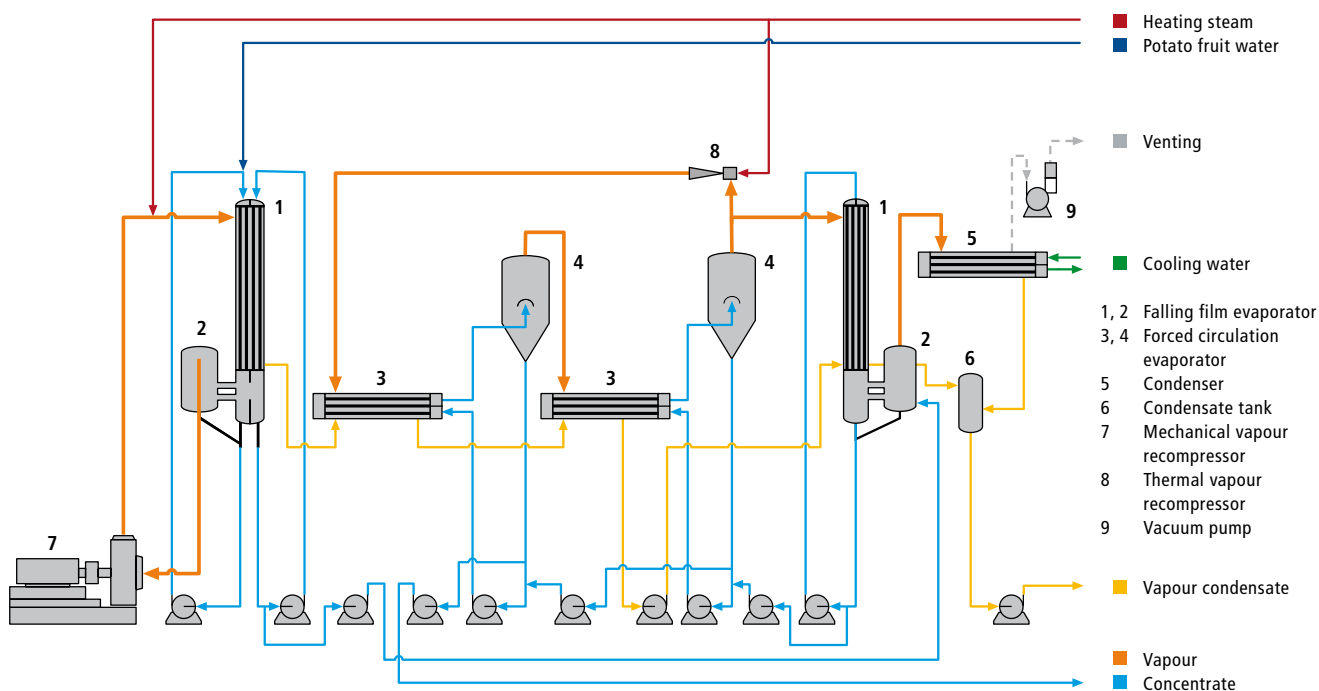
- Dryer exhaust steam
- Mechanical vapour recompression
- Thermal vapour recompression
- Steam



# Concentration of Potato Fruit Water

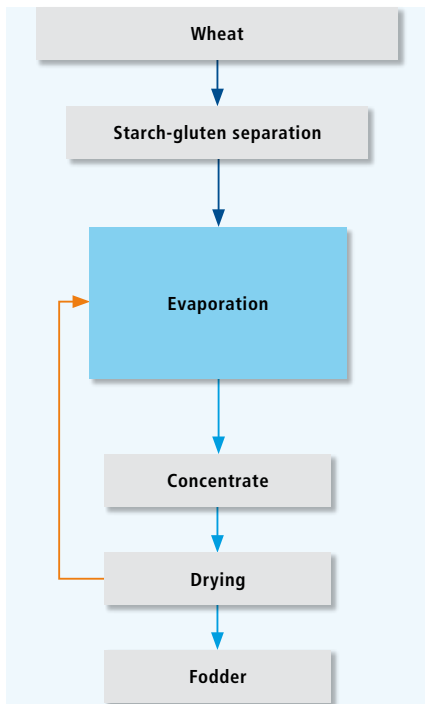


**EVAPORATION PLANT** for the concentration of potato fruit water, consisting of two identical lines. Each line with a single-effect falling film evaporator as pre-evaporator, heated by a mechanical vapour recompressor, as well as a 3-effect falling film forced circulation finisher, heated by a thermal vapour recompressor. Overall evaporation rate: 152,000 kg/h

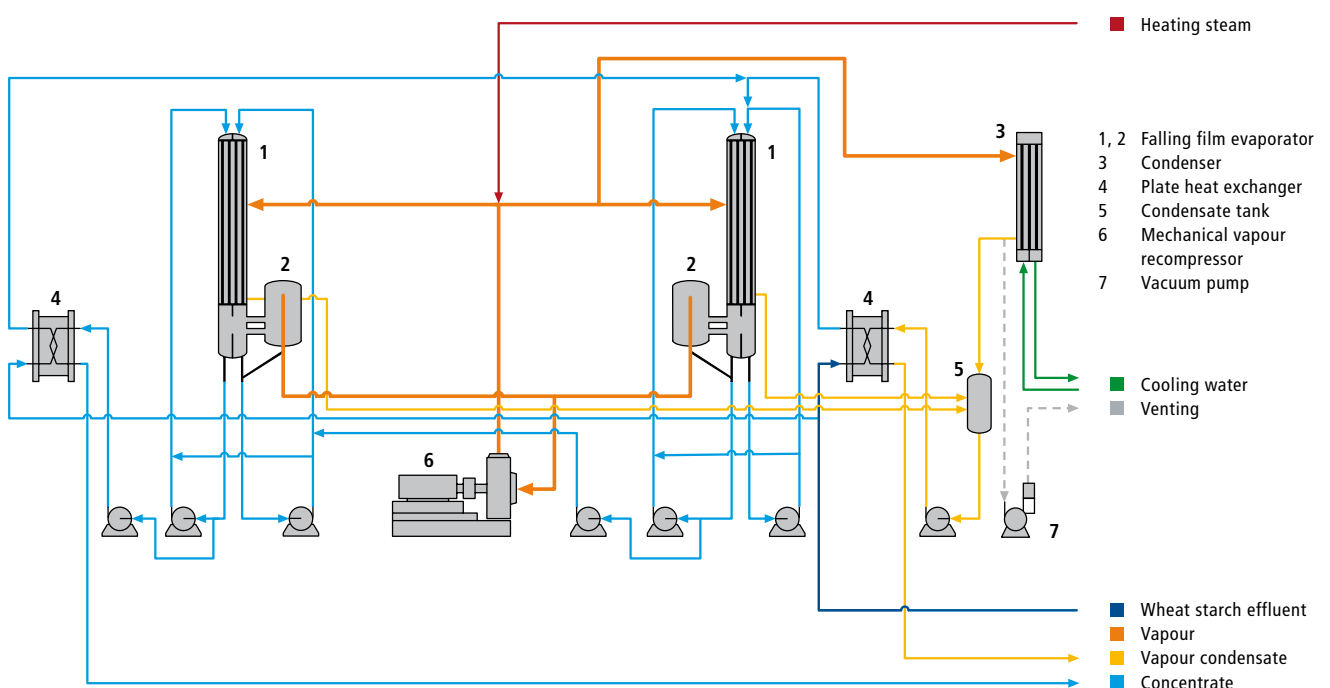




# Concentration of Effluents from Wheat Starch Production

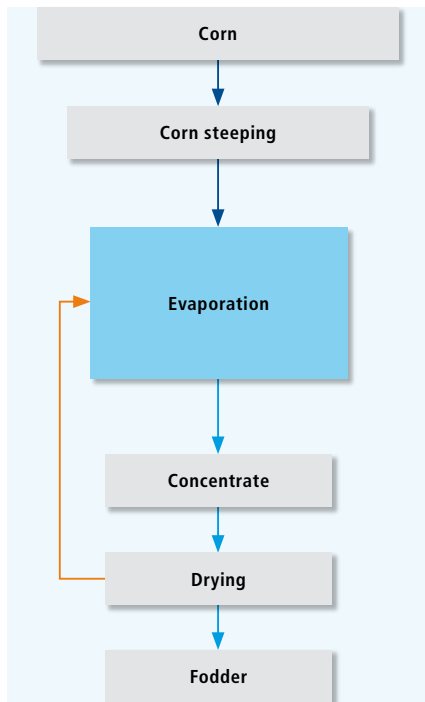


EVAPORATION PLANT for the concentration of waste waters and effluents from wheat starch production heated by means of a mechanical vapour recompressor. Evaporation rate: 30,000 kg/h

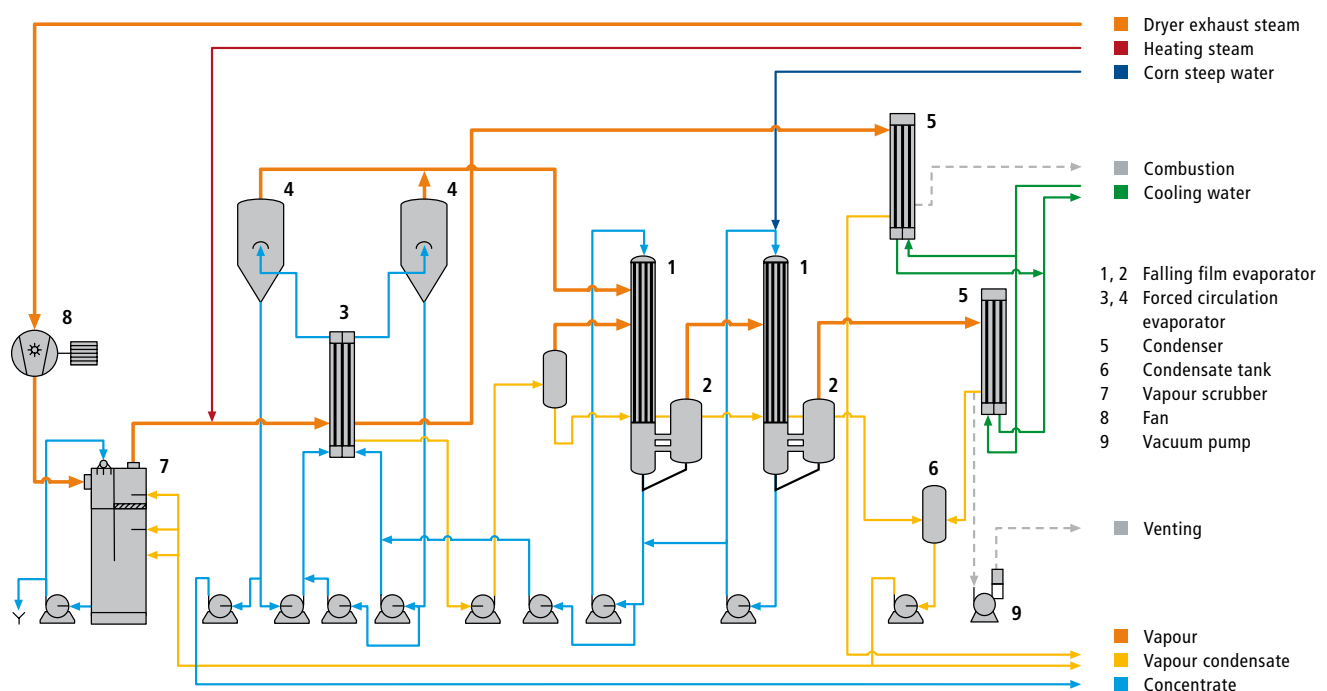




# Concentration of Corn Steep Water



**EVAPORATION PLANT** for the concentration of corn steep water.  
 3-effect falling film, forced circulation evaporator with vapour scrubber, heated by means of dryer exhaust steam.  
 Evaporation rate: 20,000 kg/h





# Concentration of Saccharification Products from Starch

In the preparation of starch saccharification products thin juices of different degrees of saccharification and of different concentrations are produced from which greases and proteins are separated and which are then concentrated in evaporation plants. The degradation degree in the basic module D-glucose is indicated with the DE value. It designates the contents of D-glucose related to the overall dry substance. The higher the DE value, the higher the portion of D-glucose molecules. GEA Wiegand has the product know-how for evaporation plants for different DE values and saccharification products.

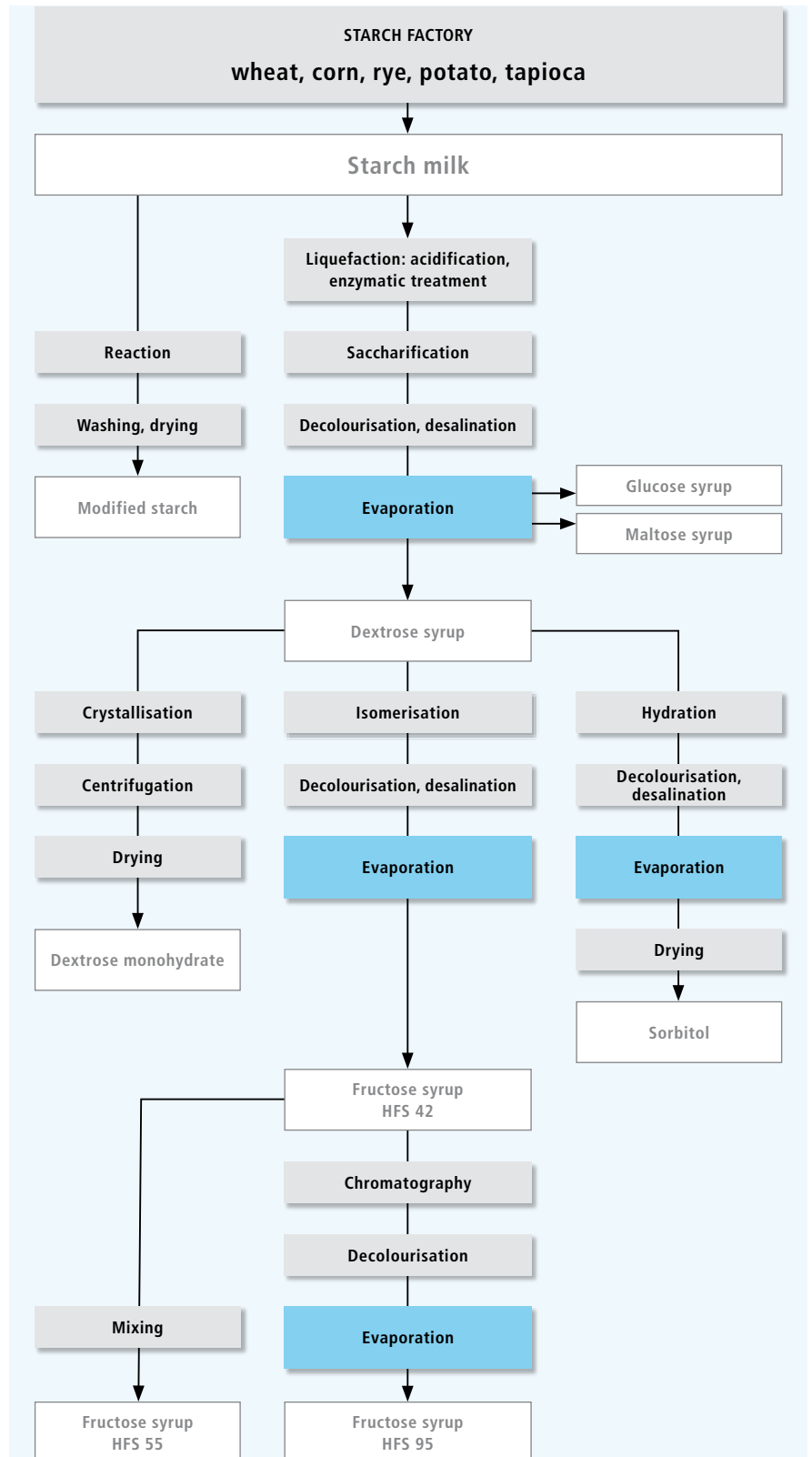
- Dextrose (pure D-glucose, DE > 90)
- Glucose syrup (DE 20 to DE 65)
- Maltodextrine (DE 3 to DE 20)
- Maltose syrup
- Isoglucose syrup (fructose 42, 55 or 70, the figure describes the fructose contents)
- Sorbitol (reproduction product of D-glucose)
- Mannitol (reproduction product of D-glucose)

## GEA WIEGAND USES THE FOLLOWING EVAPORATOR TYPES FOR CONCENTRATION

- Falling film evaporator
- Plate evaporator

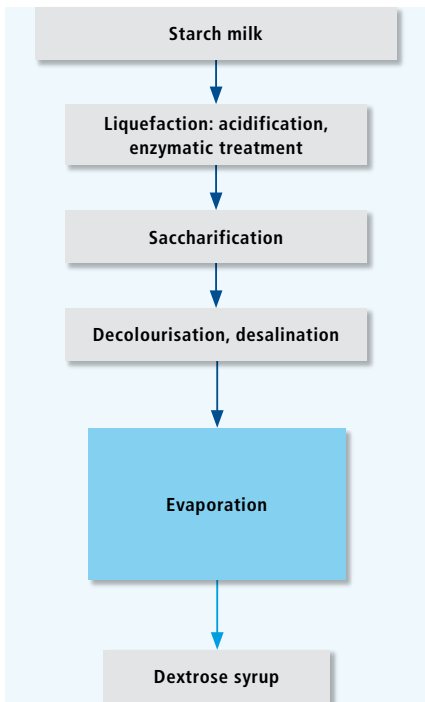
Heated by:

- Mechanical vapour recompression
- Thermal vapour recompression
- Steam
- Dryer exhaust steam

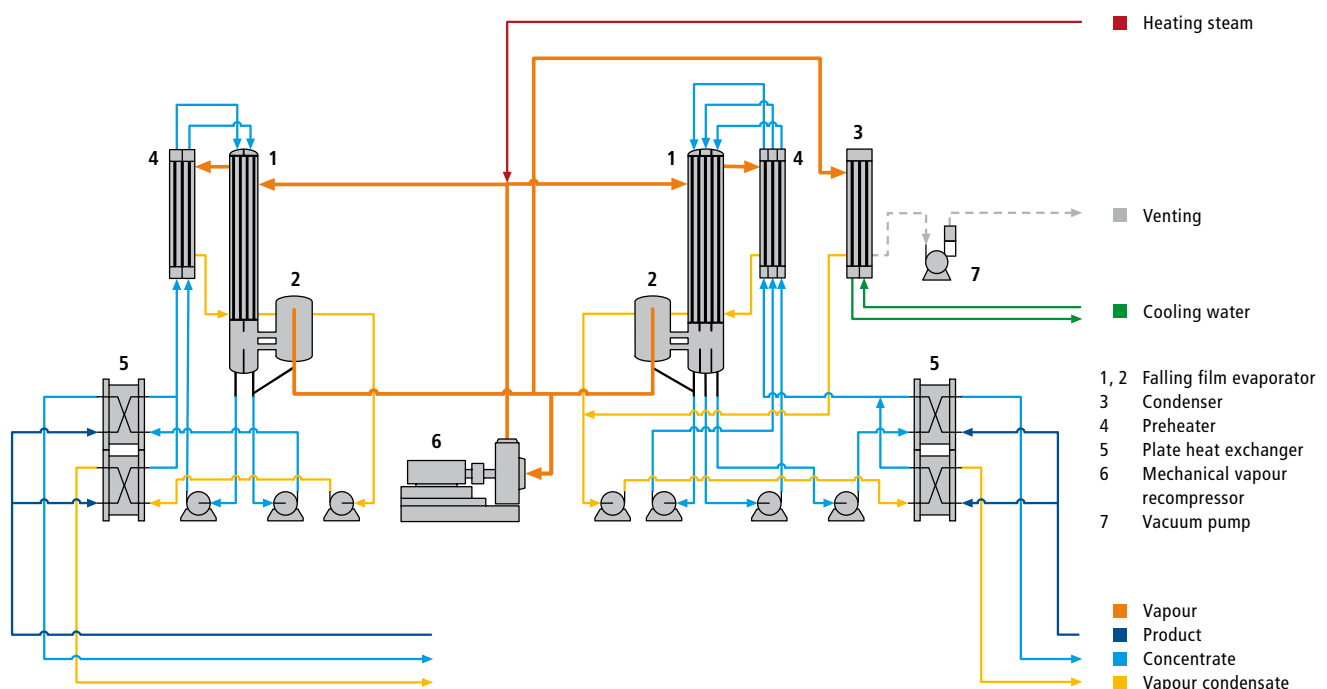




# Dextrose

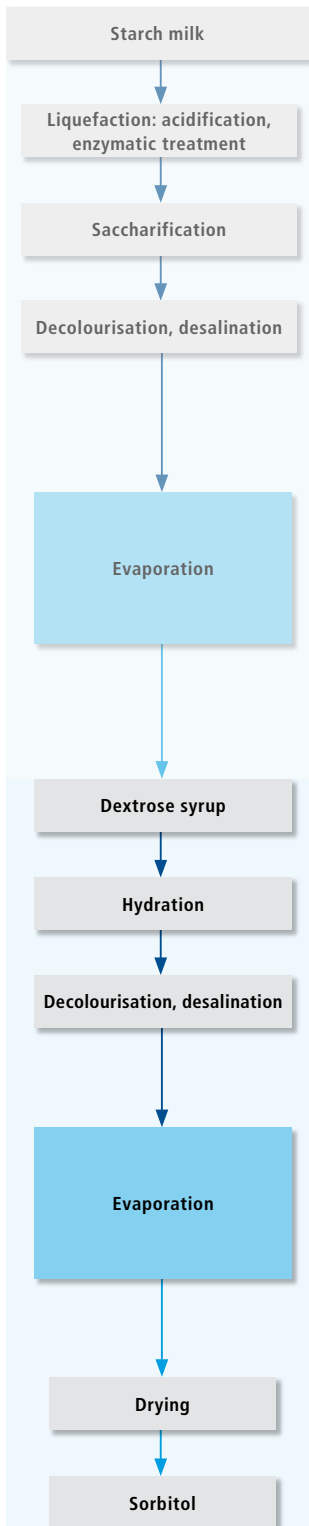


**SINGLE-EFFECT FALLING FILM EVAPORATION PLANT** with two parallel, multi-path calandria for two different starch hydrolysates, heated via a common mechanical vapour recompressor. Evaporation rate: 22,000 kg/h

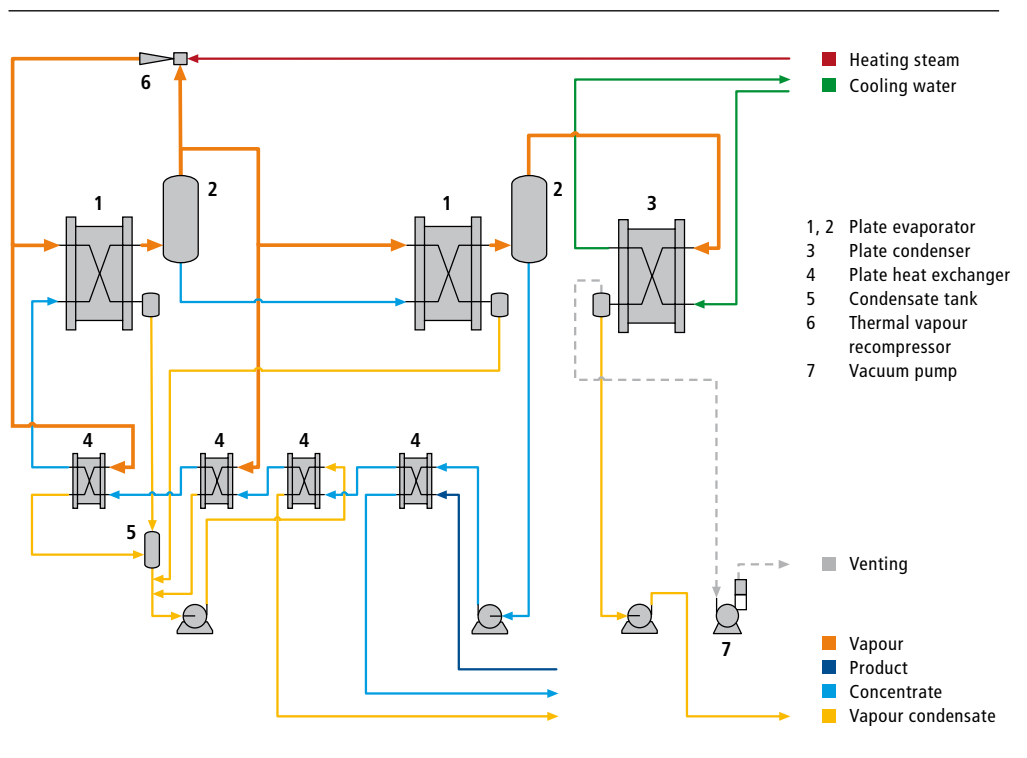




# Sorbitol

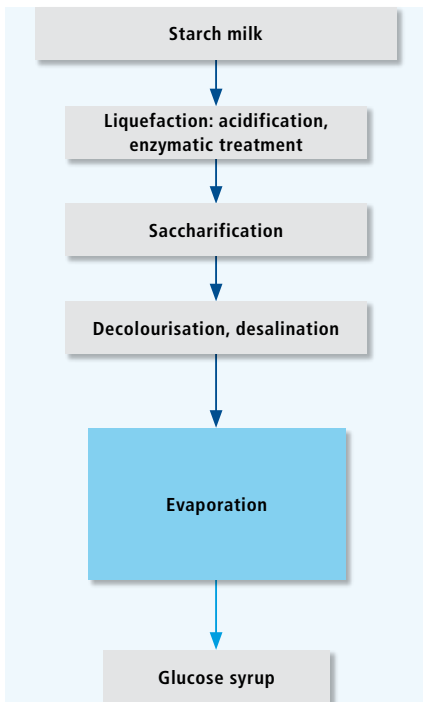


2-EFFECT PLATE EVAPORATION PLANT for sorbitol solution, heated via a thermal vapour recompressor. Evaporation rate: 4,300 kg/h

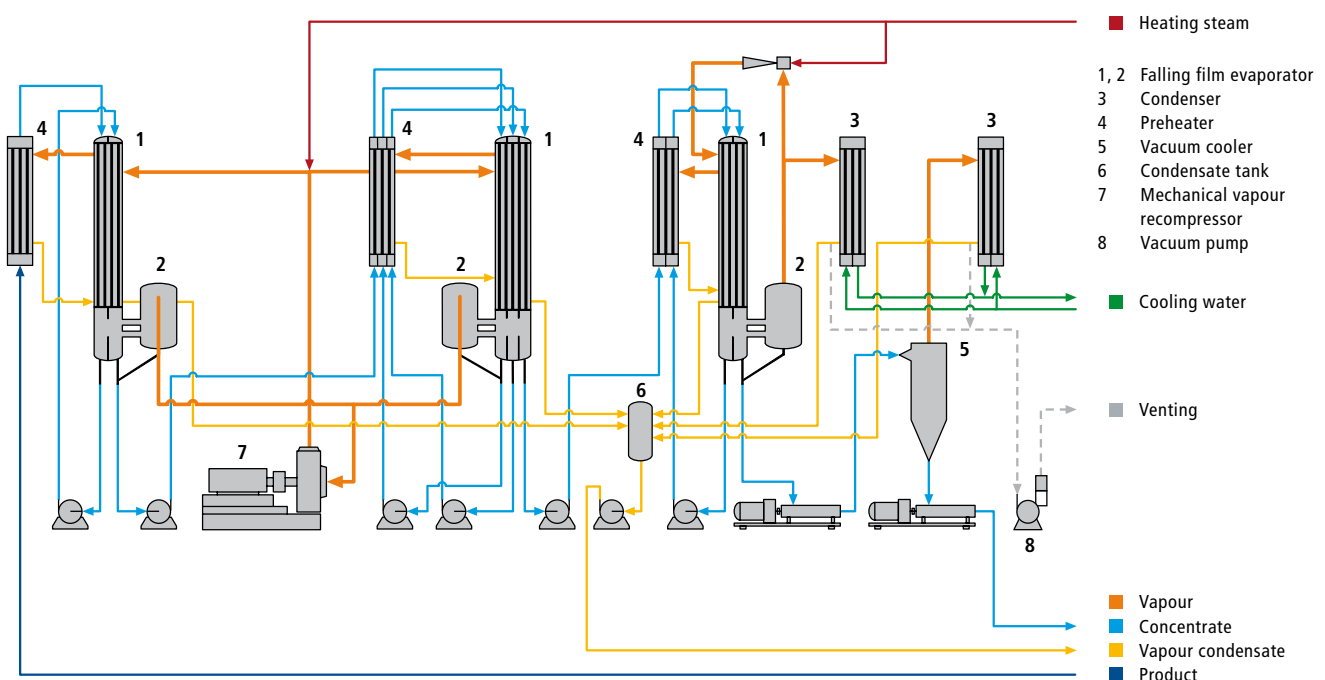




# Glucose

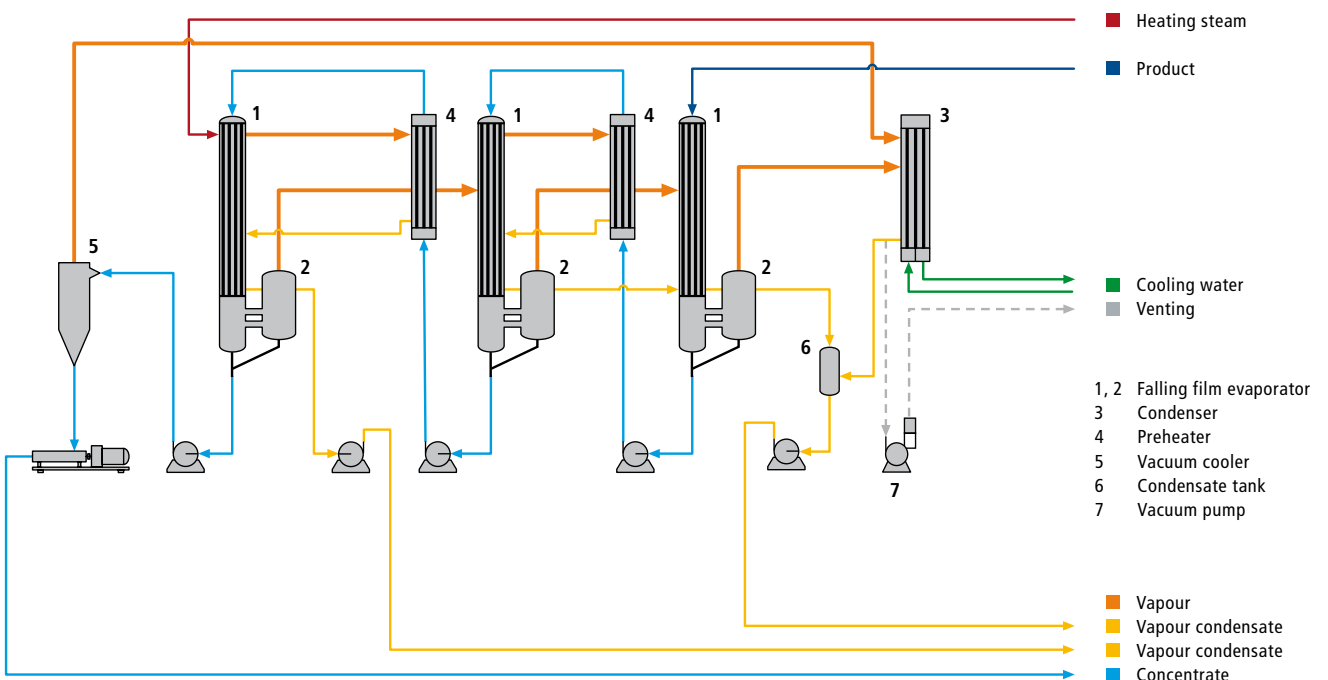


**2-EFFECT FALLING FILM EVAPORATION PLANT** with mechanical vapour recompression and single-effect falling film evaporator (finisher) with thermal vapour compressor and vacuum cooler for glucose DE<sub>30</sub> to DE<sub>55</sub>.  
Evaporation rate: 49,300 kg/h





**3-EFFECT FALLING FILM EVAPORATION PLANT**, directly heated, in co-current arrangement, with downstream-arranged vacuum cooler for the concentration of glucose syrup.  
Evaporation rate: 25,000 kg/h





## Overview on our Range of Products

### **Evaporation plants**

to concentrate any type of fluid food, process water, organic and inorganic solutions and industrial waste water; with additional equipment for heating, cooling, degassing, crystallization and rectification.

### **Membrane filtration – GEA Filtration**

to concentrate and process fluid food, process water, industrial waste water, to separate contaminations in order to improve quality and recover valuable substances.

### **Distillation and rectification plants**

to separate multi-component mixtures, to recover organic solvents; to recover, clean and dehydrate bio-alcohol of different qualities.

### **Alcohol production lines**

for potable alcohol and dehydrated alcohol of absolute purity; integrated stillage processing systems.

### **Condensation plants**

with surface or mixing condensers, to condense vapour and steam/gas mixtures under vacuum.

### **Vacuum / steam jet cooling plants**

to produce cold water, to cool liquids and product solutions, even of aggressive and abrasive nature.

### **Jet pumps**

to convey and mix gases, liquids, and granular solids; for direct heating of liquids; as heat pumps; and in special design for the most diverse fields of application.

### **Steam jet vacuum pumps**

also product vapour driven; also in combination with mechanical vacuum pumps (hybrid systems); extensive applications in the chemical, pharmaceutical and food industries, in oil refineries and for steel degassing.

### **Heat recovery plants**

to utilize residual heat from exhaust gases, steam/air mixtures, exhaust steam, condensate and product.

### **Vacuum degassing plants**

to remove dissolved gases from water and other liquids.

### **Heating and cooling plants**

mobile and stationary plants for the operation of hot-water heated reactors and contact driers.

### **Gas scrubbers**

to clean and remove dust from exhaust air, to separate aerosols, cool and condition gases, condensate vapours and absorb gaseous pollutants.

### **Project studies, engineering for our plants.**



GEA Process Engineering

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