AGRICULTURE PROCESSING



Starch-derived Sweeteners

Heat transfer and liquid handling across starch-to-syrup production.

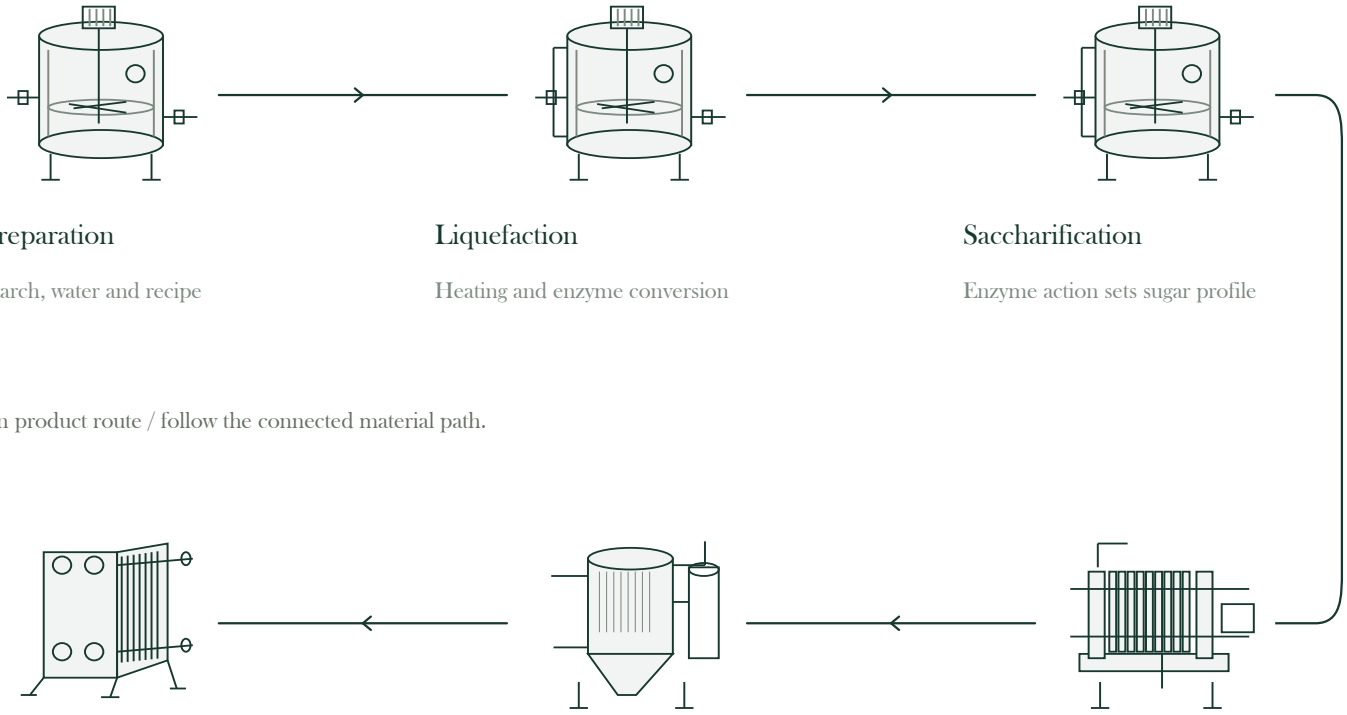
Corn: a starch-bearing crop. The process route begins with purified starch.

Photo / Wouter Supardi Salari

MATERIAL ROUTE / EQUIPMENT / BRANCHES

From starch slurry to the chosen syrup.

Starch / conversion / purified carbohydrate liquor



Slurry preparation

Purified starch, water and recipe

Liquefaction

Heating and enzyme conversion

Saccharification

Enzyme action sets sugar profile

Main product route / follow the connected material path.

Clarification and refining

Filtration; optional adsorption or exchange

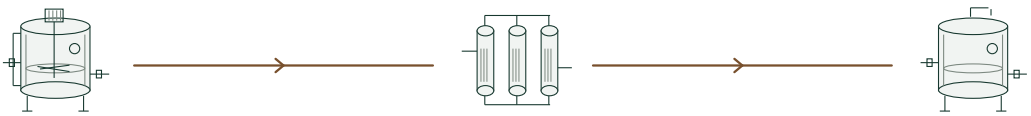
Evaporation

Concentration; separate vapour circuit

Cooling and dispatch

Handling temperature; final solids

Fructose syrup adds a dedicated conversion branch after saccharification.



Isomerisation

Enrichment, if required

Fructose syrup

SonFlow / specified slurry or vapour heat duties; ABEL CM / selected residual-slurry or dewatering duty.

PROCESS STUDY / 01

Start with a defined starch milk



Grain origins. The illustrated route begins with purified starch.

Photo / Marc Kleen

This route begins with a purified starch suspension. Recovering starch from corn, wheat or another crop is an upstream process with its own steeping or washing, milling and separation steps. Before conversion, adjust the suspension to the intended dry-solids content and confirm starch origin, water quality and residual impurities. Heating changes starch structure and can sharply alter viscosity. The feed tank, transfer system and heating arrangement must accommodate this transition, including startup and recipe changes. Free Flow is a candidate for selected particle-bearing or viscous duties, while the complete starch-cooking system and its operating conditions require separate design. A syrup route should not be confused with manufacture of dry native starch.

Starch-derived sweeteners connect a crop to a precisely specified liquid ingredient.

PROCESS STUDY / 02

Convert starch in controlled stages



Industrial vessels and pipework; utility context

Photo / Crystal Kwok

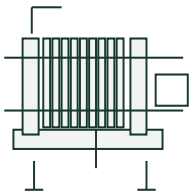
Liquefaction uses the selected enzyme and thermal conditions to break starch into shorter chains and reduce viscosity. Saccharification then converts those chains towards the carbohydrate profile required by the product. Enzyme choice, pH, temperature, solids and residence time act together; a universal operating recipe would be misleading. Cooling between stages must respect the next enzyme's operating window. Glucose syrup can proceed towards purification and concentration. A fructose-syrup route includes additional isomerisation and, for some grades, further enrichment steps. Those reactors and specialist separations remain separate equipment. Pump and heat-transfer selections should follow the fluid at each stage, not only the final syrup viscosity.

PROCESS STUDY / 03

Purify, concentrate and dispatch

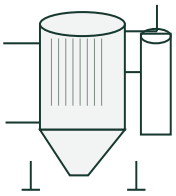
Converted liquor is clarified and purified according to its intended grade. Filtration removes suspended material; adsorption or ion exchange may address colour and dissolved impurities. These are separate functions, and a pump merely supplies the specified flow and pressure. Evaporation sets the final solids concentration, often with multiple effects or another energy-recovery arrangement. As the syrup becomes more concentrated, suction losses and heat-transfer resistance change. Maintain an appropriate storage temperature and control dilution or crystallisation risks for the specified product. Dispatch may be bulk liquid or a separate drying and powder route. State the selected route clearly rather than presenting one finishing line for every starch-derived sweetener.

OPERATION STUDY / SELECTED PROCESS DETAILS



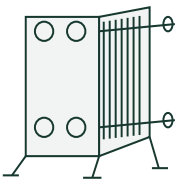
Clarification and refining

Remove suspended matter and unwanted components using the selected filtration and purification system.



Evaporation

Concentrate the purified syrup by removing water.



Cooling and storage

Bring the syrup to its specified handling temperature before storage and dispatch.

Explanatory equipment studies / configuration, controls and treatment conditions follow the selected product route.

SONFLOW / FREE FLOW PLATE HEAT EXCHANGER

Space for demanding media

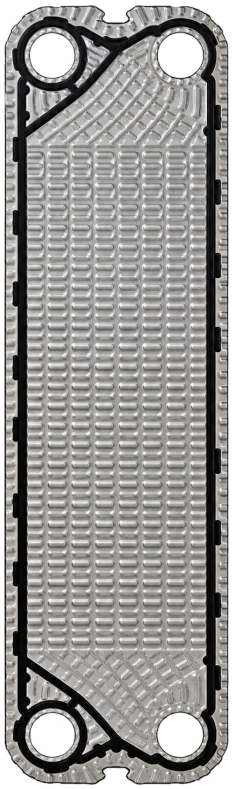
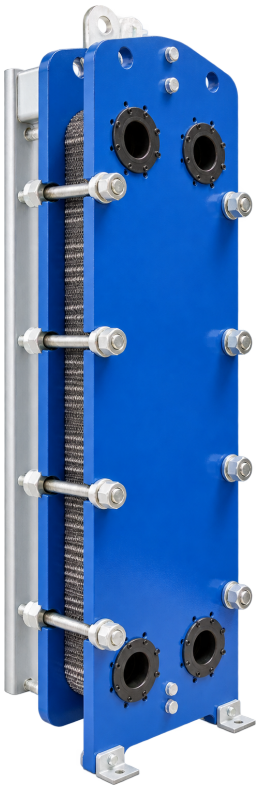


PLATE / FLOW PASSAGE



FRAME / COMPLETE UNIT

The Free Flow design can be assessed where solids, fibres or viscosity make ordinary channels unsuitable. The appropriate sanitary or Free Flow arrangement depends on the actual product and hygiene requirements.

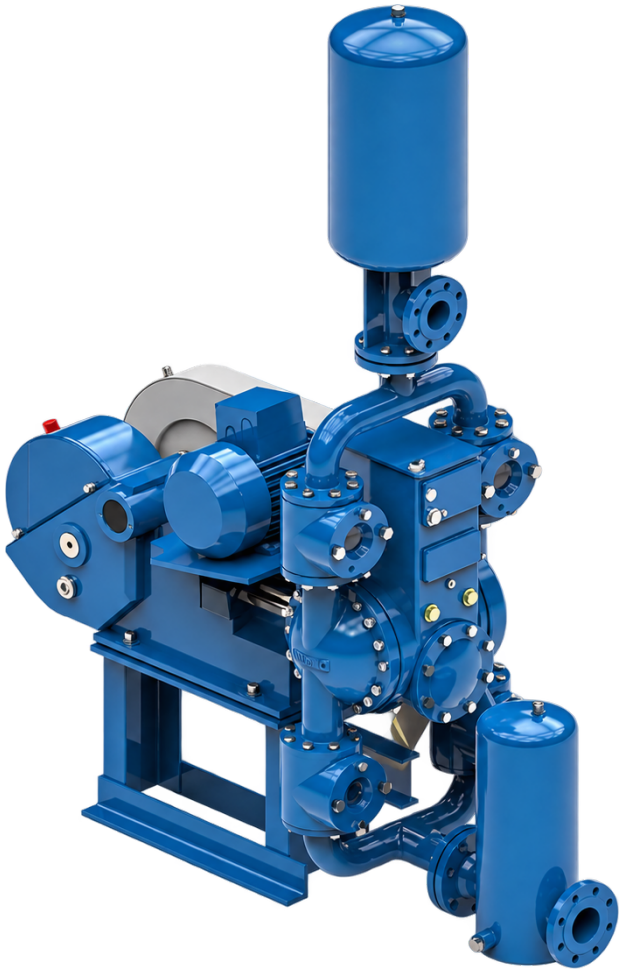
An assessment is required for the particular slurry; no validated starch-cooker performance is implied.

EXPLORE SONFLOW /

ABEL / CM / FILTER-PRESS FEED

Feed the dewatering cycle.

Where the site selects filter-press dewatering, an ABEL CM can be assessed as the feed pump. The pressure and flow change through the filling and pressing cycle.



ABEL / CM COMPACT DIAPHRAGM FAMILY

The press performs separation. Specify solids, abrasiveness, chemistry, suction and the pressure cycle; do not substitute this auxiliary duty for product clarification.

EXPLORE ABEL /

SONFLOW / CONDENSER/EVAPORATOR

Condense with a defined duty

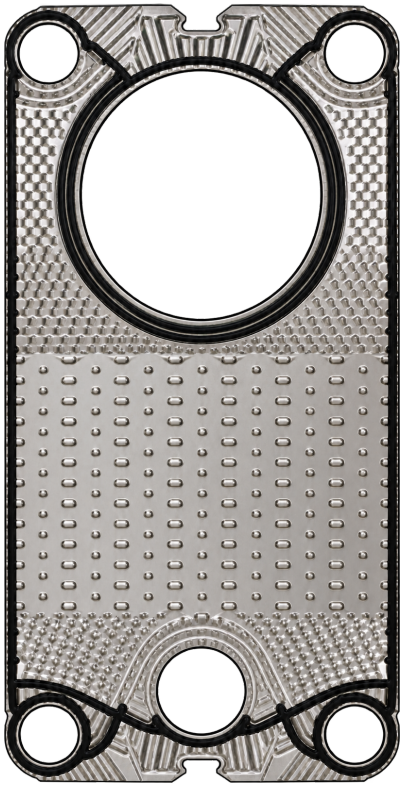


PLATE / FLOW PASSAGE



FRAME / COMPLETE UNIT

SonFlow's low-pressure vapour design is a candidate for condensation duties in a concentration system. The vapour inlet, cooling-water circuit and condensate conditions must be sized together.

A condenser is one component; it does not supply the whole evaporation, vacuum or conversion system.

EXPLORE SONFLOW /

CONTROL THE PROCESS OUTCOME

Specify a carbohydrate profile.

Soluble solids alone do not define syrup grade. Confirm the carbohydrate distribution, conversion measure, colour, ash or conductivity and relevant microbiological criteria. Enzyme dosing and reaction endpoints need process-specific verification. Residual particles, cleaning chemicals and unintended dilution affect downstream quality. Validate heat-exchanger selection across the full conversion cycle because early suspension, liquefied starch and concentrated syrup have different rheology.

WATCH THE INTERFACES

01 Enzyme windows and residence time

02 Target glucose/fructose profile

03 Purification waste and condensate quality

THE AUXILIARY ROUTE

Account for purification losses.

Keep starch yield, conversion yield and final product recovery separate in the material balance. Purification generates wash water and spent media; evaporation produces condensate whose reuse depends on its measured quality. A SonFlow condenser may serve a defined vapour duty. ABEL CM can be assessed for residual-slurry transfer, while CM filter-press feed is relevant only where that dewatering technology is actually selected.



Water discharge at Tereos Syral, Aalst; a reference for the residual-water branch.

Photo / AnonymousUnknown author / CC0 / cropped & resized

EXPLORE THE RELATED EQUIPMENT /

TURN THE ROUTE INTO A USEFUL ENQUIRY

Specify the material. Define the duty.

Lecoqimex can support selected thermal and utility duties around the conversion and concentration system. The process chemistry, enzyme residence time, filters and evaporator configuration remain separate design responsibilities. A useful review also asks how start-up, product changes and cleaning alter the duty seen by each component.

01 Starch origin and dry solids

02 Enzyme windows and residence time

03 Target glucose/fructose profile

04 Syrup viscosity versus temperature

05 Purification waste and condensate quality

RESEARCH BASIS / SELECTED PRIMARY REFERENCES

Alfa Laval starch and sweetener production / Cargill cereal sweeteners production / Novonesis starch liquefaction / Novonesis starch saccharification / SonFlow Free Flow / SonFlow condenser/evaporator

PHOTOGRAPHIC REFERENCES

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BEGIN THE CONVERSATION

A considered process. A useful conversation.

Tell us about your stream, the operating conditions and the result you want to achieve.

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Starch-derived Sweeteners / Agriculture processing