PROTEIN PROCESSING

# Plant-protein wet fractionation

## Separate the value. Respect the structure.

Plant-protein manufacture is a sequence of distinct transformations. A pea, pulse or oilseed feedstock is prepared for extraction, its fractions are separated and the protein is purified for its intended use. Thermal equipment and transfer systems must be selected for the stream at each stage, rather than for the plant as a whole.



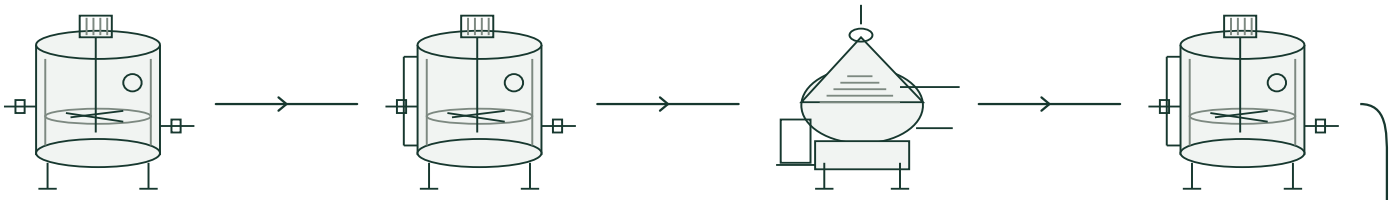
Chickpeas: one possible pulse feedstock.

Photo / Karyna Panchenko

MATERIAL ROUTE / EQUIPMENT / BRANCHES

# Separate protein, starch and fibre deliberately.

Prepared crop / protein liquor / purified fraction



### Slurry preparation

Prepared crop; selected water conditions

### Protein extraction

Crop-specific solubilisation conditions

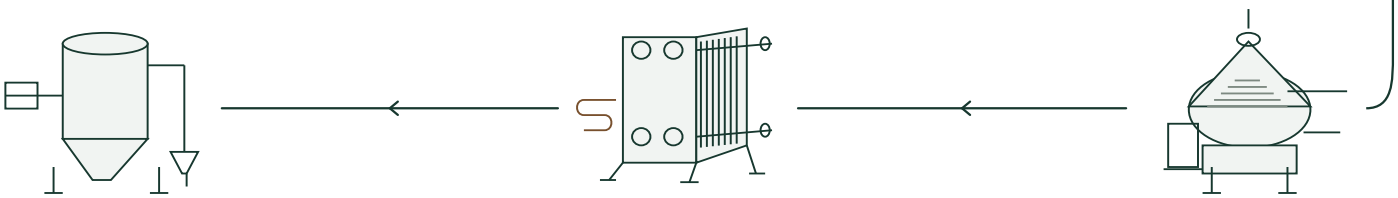
### Fraction separation

Protein liquor separates from starch / fibre

### Protein purification

Selected precipitation or membrane route

Main product route / follow the connected material path.



### Concentration / finishing

Liquid product or specialist powder route

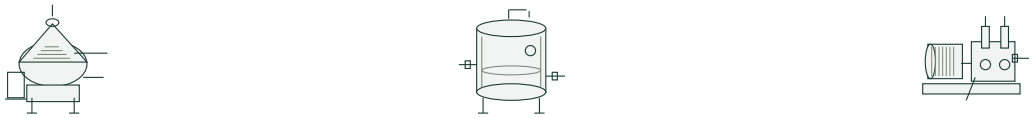
### Thermal treatment

Product-specific heating and cooling

### Collection and washing

Recover protein; manage wash water

Starch and fibre are parallel recovery branches, not finished protein.



### Starch recovery

### Fibre outlet

### Residual water / slurry

SonFlow Free Flow / suitable particle-bearing duty; food-configured ABEL CM / qualified slurry transfer; sanitary exchanger / protein-liquid treatment.

PROCESS STUDY / 01



# Disperse the crop for the chosen route

Wet fractionation begins with a defined flour, flakes or another prepared feedstock. For a representative alkaline/isoelectric route, water and conditioning make the target proteins soluble before dedicated separation. Feedstock composition, particle size, pH, temperature and residence time influence extraction. Pea and other starch crops also contain starch and fibre, while oilseed-derived feedstocks follow their own upstream preparation. The process needs a feed-specific material balance. Free Flow can be investigated for selected particle-bearing heat duties. A food-configured diaphragm pump is a candidate for a defined slurry transfer only after hygienic, passage and real-product testing; it does not replace an extraction decanter.

Whole beans: a pulse-feedstock study.

Photo / David Gabrielyan

PROCESS STUDY / 02

# Separate the protein and its co-products

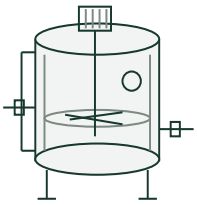
Specialist separation divides protein-bearing liquor from insoluble material. A further extraction or washing stage may recover additional protein. Starch-crop processing can then separate fibre and wash starch in a dedicated branch. In the representative isoelectric route, adjusting the liquor's pH precipitates protein, which another separator recovers from the aqueous phase. Washing can improve purity according to the intended grade. These centrifuges, screens and hydrocyclones remain distinct machines. Lecoqimex transfer and thermal equipment can support selected connecting duties, but cannot be presented as direct replacements for the full fractionation system.

OPERATION STUDY / SELECTED PROCESS DETAILS



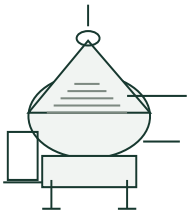
## Separate other fractions

Use specialist separation to remove fibre and starch.



## Purify the protein

Select precipitation or membrane treatment for the product specification.



## Collect and wash

Recover the protein fraction and wash it where the route requires.

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

PROCESS STUDY / 03

# Finish for functionality, not only purity

Condition the recovered protein for its intended downstream product. Neutralisation, thermal treatment, concentration and drying may be included according to the selected route and product target. Functional properties such as solubility, emulsification and gel formation can change during heat exposure and mechanical handling. A sanitary exchanger can be assessed for a suitable conditioned liquid, with fouling and viscosity verified separately from the raw slurry. Liquid ingredient and powder manufacture have different finishing requirements. Where nitrogen is used for a defined powder-packaging duty, a Mehrer booster is relevant only if the gas supply requires compression. It does not provide the packaging machine or nitrogen generator.



Industrial vessels and pipework; utility context

Photo / Crystal Kwok

SONFLOW / FREE FLOW

# Assess the particle-bearing stream

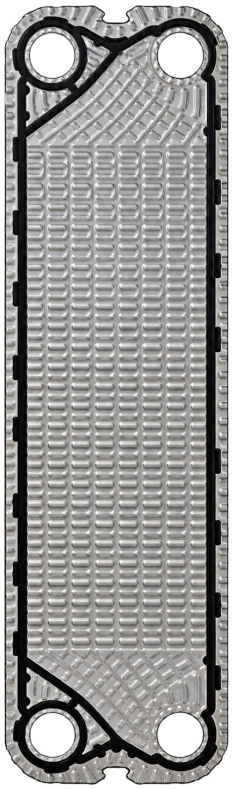
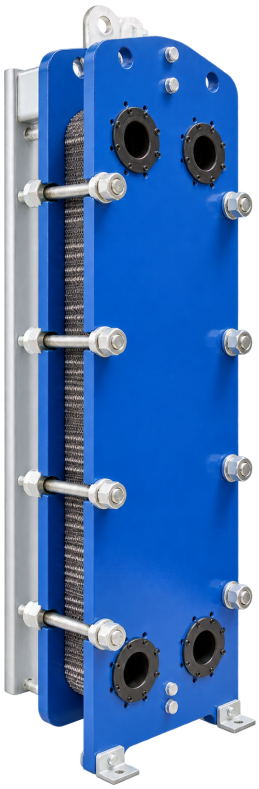


PLATE / FLOW PASSAGE



FRAME / COMPLETE UNIT

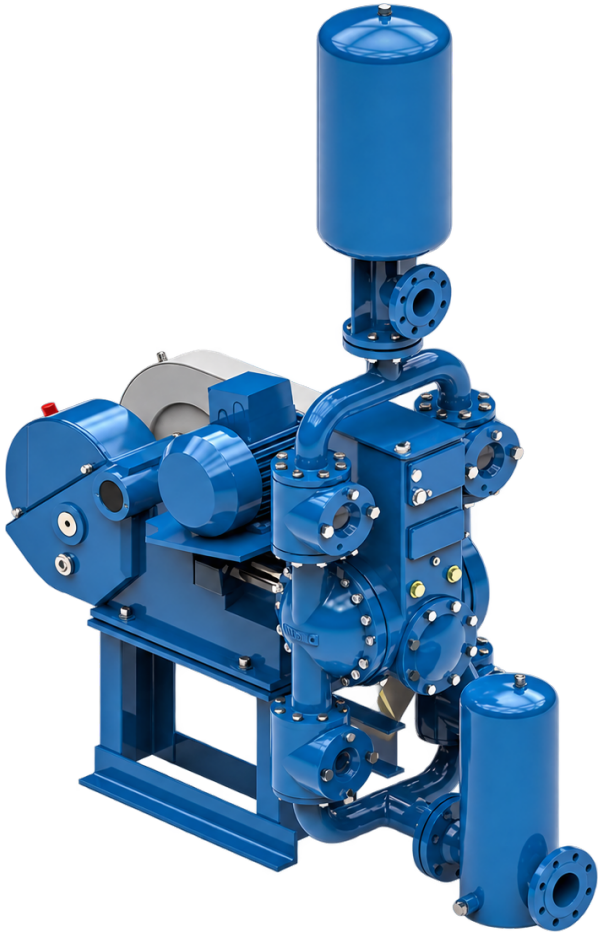
Free Flow offers passages for media containing fibres or particles. It can be investigated for pumpable plant streams needing heat exchange, after checking particle characteristics, viscosity and cleaning. It does not perform protein extraction or centrifugal separation.

Proposed application match for characterised media; thermal treatment and the required sanitary configuration remain project-specific.

EXPLORE SONFLOW /

ABEL / CM / FOOD-CONTACT CONFIGURATION

# Match the pump to the slurry.



ABEL / CM COMPACT DIAPHRAGM FAMILY

A food-configured CM is an engineering candidate for a defined protein-slurry transfer. Suitability requires product trials and confirmation of hygienic construction; an installed protein application is not claimed.

Confirm stainless wetted construction, valve passage, seals, cleanability and permissible pressure. The illustration shows the family; the supplied food configuration is specified for the duty.

EXPLORE ABEL /

SONFLOW / SANITARY PLATE HEAT EXCHANGER

# Control the protein-liquid duty

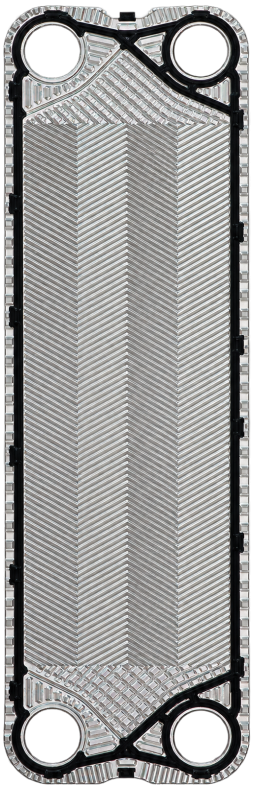


PLATE / FLOW PASSAGE



FRAME / COMPLETE UNIT

SonFlow lists proteins and concentrates among its food-processing heat-exchanger applications. For a suitable protein stream, establish the required temperature programme and a hygienic configuration. Product functionality, fouling behaviour and residence-time requirements must guide selection.

Suitable-stream heating/cooling candidate, not a complete pasteurisation system; holding time, controls and validation require separate engineering.

EXPLORE SONFLOW /

CONTROL THE PROCESS OUTCOME

# Evaluate the ingredient in use.

Measure protein recovery and purity alongside the functionality needed by the customer. Feedstock variability affects flavour, colour, extraction and cleaning. Track chemical conditioning, residual impurities and microbiological acceptance through the route. Validate equipment with representative slurry and final ingredient; a water test does not demonstrate protein handling. Confirm food-contact construction for every product-path component, including an ABEL candidate if selected.

A PROCESS SPECIFICATION

Feedstock composition and particle size

Protein yield, purity and functionality

Liquid/powder finishing and gas requirements

VERIFICATION IN OPERATION

In a representative wet route, prepared plant material is mixed with water to form a slurry. The extraction conditions solubilise protein; dedicated separation equipment then removes fibre and starch according to the feedstock. Purification can use precipitation or membrane-based methods. A precipitation route collects the protein solids and may wash them before further processing. The chosen product then receives its specified thermal treatment, concentration and drying or liquid finishing. These routes differ by raw material and target functionality, so the diagram is a conceptual process, not a universal production recipe.

THE AUXILIARY ROUTE

# Account for every wash.

Extraction and washing create water demand and residual organic loads. More washing can improve purity while adding separation, concentration and effluent duties. Identify useful starch and fibre outlets before applying recovery credits. ABEL CM can be assessed for a pumpable residual stream independently of the food-path selection. Heat recovery should follow the real temperature levels, and nitrogen supply should reflect the actual packaging and storage requirement.



Drinking-water treatment plant; a reference for the dedicated water-treatment duty.

Photo / Eric Vance / US EPA



MEHRER / TZW FAMILY STUDY

EXPLORE THE RELATED EQUIPMENT /

TURN THE ROUTE INTO A USEFUL ENQUIRY

# Specify the material. Define the duty.

Start with representative feedstock samples and the intended protein specification. Provide solids concentration, pH range, viscosity at operating temperature and the extraction conditions under consideration. Document the purification route, required thermal programme and acceptable pressure loss. Trials should determine fouling and the cleaning method as well as product functionality. These results support equipment selection without suggesting that one thermal unit determines extraction yield or isolate purity.

01 Feedstock composition and particle size

02 Extraction pH and residence time

03 Protein yield, purity and functionality

04 Washing and residual-water balance

05 Liquid/powder finishing and gas requirements

RESEARCH BASIS / SELECTED PRIMARY REFERENCES

Protein-processing category / Wet extraction, purification and heat-treatment routes / Feedstock-dependent plant wet fractionation sequence / SonFlow / Free Flow / SonFlow / Sanitary plate heat exchanger / SonFlow / Sanitary plate heat exchanger

PHOTOGRAPHIC REFERENCES

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BEGIN THE CONVERSATION

# From a precise brief to a considered choice.

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

services@lecoqimex.com

+33 7 82 85 35 55

lecoqimex.com

8 place Mejane
06560 Valbonne, France

Plant-protein wet fractionation / Protein processing