



Game-changing separation
solutions for fish, crustacean
and by-products processing

Separation centrifuges



Alfa Laval reserves the right to change specifications without prior notification.



Alfa Laval

Separation centrifuges

Game-changing separation solutions for fish, crustacean and by-products processing

Global fishing operations are often confronted with significant regulatory and environmental challenges, including severe stock depletion and sustainability issues. Today's key issue is the efficiency of processing catches and by-products into commercially viable fish meal and oil.

Whether you need centrifugal processing equipment or complete process lines to produce fish meals and fish oil, Alfa Laval meets your most demanding requirements. We have been supplying advanced equipment to the fishing industry for more than a century. Our original products in this field were centrifugal decaners and separators, used to separate the different fractions and to polish the oil from settling tanks.

Today, our products and systems provide a multitude of individual functionalities that include heaters, decanter centrifuges, high-speed separators, heat exchangers, evaporators, pumps, valves and fittings, as well as complete processing plants for installation either on land or at sea.

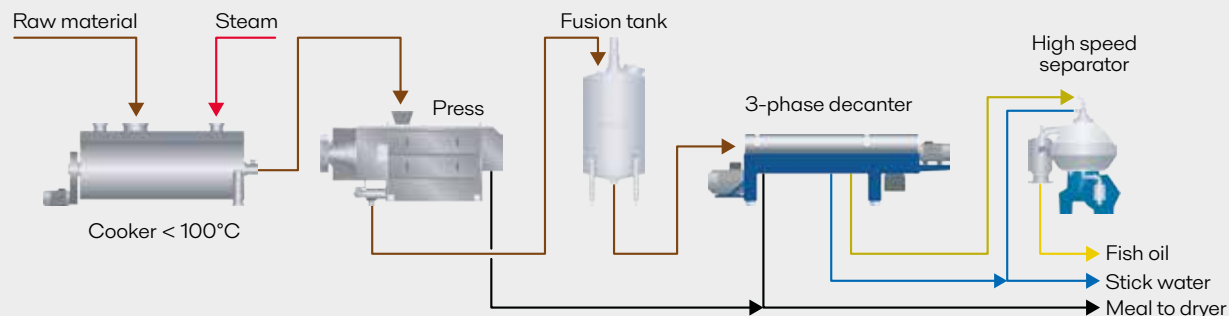
Alfa Laval's world-leader position as the supplier of choice for separating technologies and equipment for the fishing industry – both ashore and afloat – is based on our proven ability to provide superior service and to work closely with our customers.

We supply centrifugal equipment for:

- Conventional fish meals
- High digestible or extra lean meals
- Virgin fish oil
- Fish silage
- Surimi
- Hydrolyzed fish protein concentrate (H-FPC)

With specialists in several countries and a global network spanning 125 countries, we understand our customers' needs. Our engineers provide state-of-the-art technology tailored to local conditions, helping you enhance manufacturing capabilities and competitiveness.





- Whereas two-phase decanter was common, nowadays typically three-phase decanter to directly split into three fractions.
- Solids from the decanter centrifuge are sent to a **dryer** along with solids from the press to provide a final meal product.
- With two-phase decanter, the typical set-up is to use two **high-speed separators**: first, a concentrator to separate water and oil, and then a purifier to polish the oil before storage.
- Stick water will be further concentrated and mixed into the solids fraction to increase protein content.

Two- or three-phase decanters can be used for separation of the three fractions. This means, these decanter centrifuges play a key role in achieving fish meal with a low oil content while simultaneously increasing the protein content.

Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Taylor-made solutions from simple fixed differential speed to advanced torque control
- Special conveyor design to reduce wear and FiDM on a consistent basis
- Stable oil quality outlet from high-speed separator
- 360° outlet no blocking
- Stable interphase with power tubes on three-phase design

Press water stems from the wet rendering process, featuring a cooker, press separation equipment (such as decanter centrifuges and high-speed separators) and – finally – dryers and the appropriate packing equipment.

How it works

- **Heating** of the raw material in a cooker in which the temperature is kept below 100°C. This makes it possible to recover stick water that contains most of the soluble protein – which usually provides the highest digestibility.
- **An expeller screw press** is normally included to separate solids from liquid.
- The liquid fraction or juice from the press (perforated screw conveyor) is separated in the **decanter centrifuge** into solids, stick water and oil.
- With three-phase decanter, oil will be finally polished into a high-speed separator set as purifier.

Fish press water

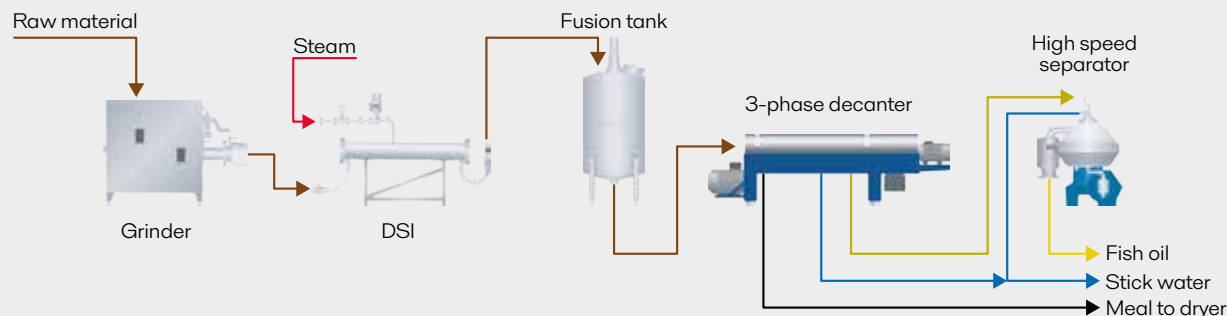
Wet rendering - whole fish and fish by-products



Fish oil out of a separator

Centriflow

Wet rendering - whole fish, by-products and crustacean processing



- Oil can be polished further in a **high-speed separator**.
- Solids are sent to the dryer to get the final meal product.

Operating results

Due to the short processing time and low temperature, there is no increase in the free fatty acid (FFA) content or in the peroxide value of oil rendered in an Alfa Laval Centriflow plant. Outstanding colour and low water content are other distinctive features of the high-quality oil produced this way.

The Centriflow process is very quick, and ensures that your end products feature the highest digestibility and oil purity. The heating step in the DSI also ensures that your rendering processes require as little steam as possible.

There is no loss of water or any by-products in this process. The condensate from the evaporator is of very good quality, and can be reused for heating or cleaning.

Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Meal with the highest possible digestibility
- No oxidation of the oil
- Lowest possible steam consumption
- All equipment easily CIP-able

Centriflow is a wet rendering process to convert whole fish and fish by-products or crustacean like krill into edible oil and high-protein and lean meal. It is a diverse process, available in a range from technical to food grade, with the ability to process fast for best possible quality and scalability, from small lab-scale capacities up to industrial business.

How it works

- **Mincing** and very quick **heating** in a direct steam injection (DSI) heater where the input is gently and very quickly heated using direct steam.
- **Fusion tank**, with agitation, to make sure the processing flow is homogenized before it passes to separation.
- **Three-phase decanter centrifuge** to separate the different fractions.
- Stick water is concentrated in an evaporator and mixed with solids.





Oil Plus

Wet rendering - maximizing oil extractions

Oil recovery improvement

The Oil Plus decanter centrifuge, providing customers maximum oil recovery, along with a reduction of at least 2% fat in dry matter (FiDM) and even more in the final fish meal. This means more oil is recovered and you can achieve higher protein content in your meal.

How it works

Oil Plus is a two-phase decanter for a three-phase suspension, where one discharge phase is for oil only. The working principle is similar to a skimmer. Solids and water will get out from solids outlet like a wet slurry and oil will get out from oil outlet.

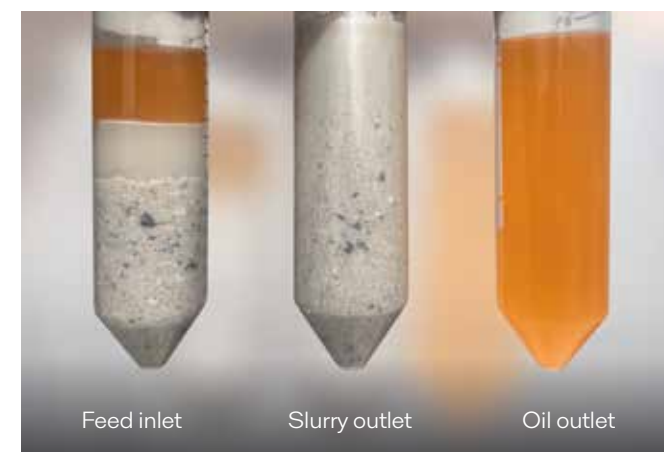
Operating results

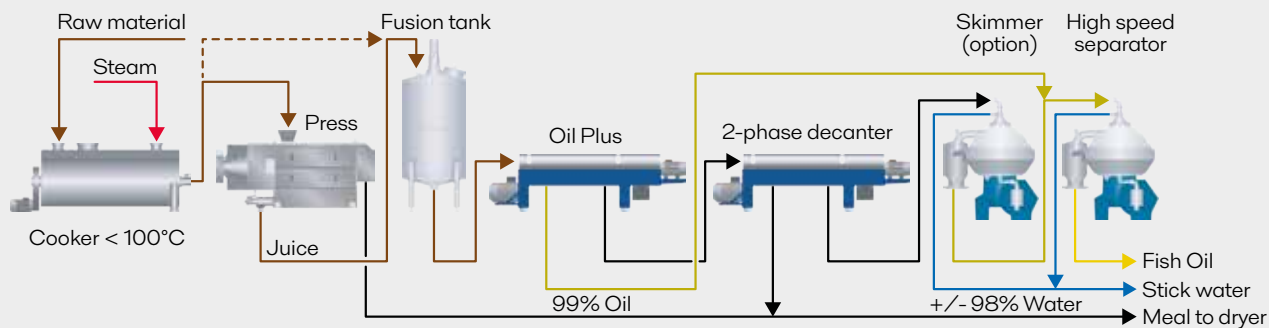
Alfa Laval Oil Plus decanter centrifuges extract virtually every drop of free oil, with purities of as high as 99%, with only tiny traces of water or fine solids left behind,

and the highest de-oiling effect on the solids. The quality of the slurry (consisting of water and solids) shows no free available oil after an appropriate spin test.

Customer benefits

- **Oil Plus decanter centrifuges** can be installed in new lines or existing ones to maximize oil recovery. Depending on the raw material mix and the size of the particles in the feed flow, the press can also be bypassed. This is an ideal solution in cases where the focus is on increased liquefaction and loss of structure in the raw material, making it more difficult to operate presses at an economical level of efficiency
- **Simple process setup:** There is less need for peripheral equipment such as pumps, tanks, piping, etc
- **Best operating results:** The operating parameters for Oil Plus decanter centrifuges can be easily optimized to achieve the best possible results, including higher oil recovery and higher protein content in the final fish meal
- **Easy to operate:** Oil Plus is very easy to operate and very stable even with fluctuations in feed flow or composition. Little or big variations of oil in the feed are not a problem. It also requires very little attention in operation
- Higher oil yield than with traditional decanters
- Open outlets for stable interphase
- Less need for peripheral equipment





Oil Plus does not need adjustment over the years when different fish species are processed or the composition changes. Oil Plus decanter allows for a fast extraction after heating, and does not need structure in the feed compared to a press.

Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Efficient with low and high TVN value
- Higher oil yield
- Less oil in the dry matter
- Stable operation using an Oil Plus decanter centrifuge
- Less need for peripheral equipment in case of a step for washing.

Upgrade existing or new processing press water lines with the Oil Plus effect

Fish press water upgrade

Two phase version

Wet rendering - whole fish
and by-products

It is easy to integrate Oil Plus decanter centrifuge into existing wet rendering processing lines to improve oil yield and ensure a deoiled fish meal.

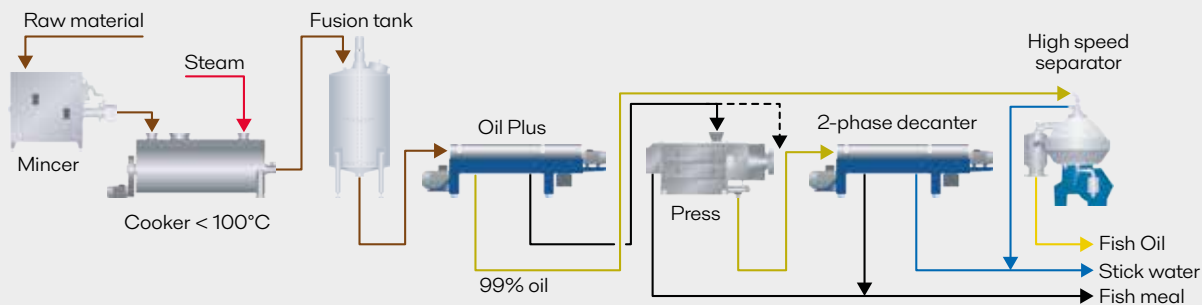
Validated and proven technology, reaching up to 99 Vol.% fish oil.

Improving FiDM (Fat in Dry Matter) in the final meal on any wet rendering system, no matter if a conventional press or any other is used or even with high TVN value in raw material.

Press water line for fish processing

Oil Plus decanter centrifuges can be installed between the press and an existing decanter unit to extract as much as possible oil from the juice.





Upgrade existing or new processing lines with the Oil Plus effect

Fish press water upgrade

Three phase version
Wet rendering - whole fish
and by-products

Maximizing oil recovery as all the solids pass through the Oil Plus. Validated and proven technology, reaching up to 99 Vol.% fish oil.

Improving FiDM (Fat in Dry Matter) in the final meal on any wet rendering system, no matter if a conventional press or any other is used or even with high TVN value in raw material.

Press water line for fish processing

Oil Plus decanter centrifuges can be installed before the press to maximize oil recovery as all solids pass through the Oil Plus.

It is recommended to add a grinder or mincer to maximize oil recovery and get a pumpable product to the Oil Plus decanter

This is an ideal solution in cases where the focus is on increased liquefaction and loss of structure in the raw material, making

it more difficult to operate presses at an economical level of efficiency. Press can be kept if structure in the feed needs additional breakdown.

Oil Plus does not need adjustment over the years when different fish species are processed or the composition changes.

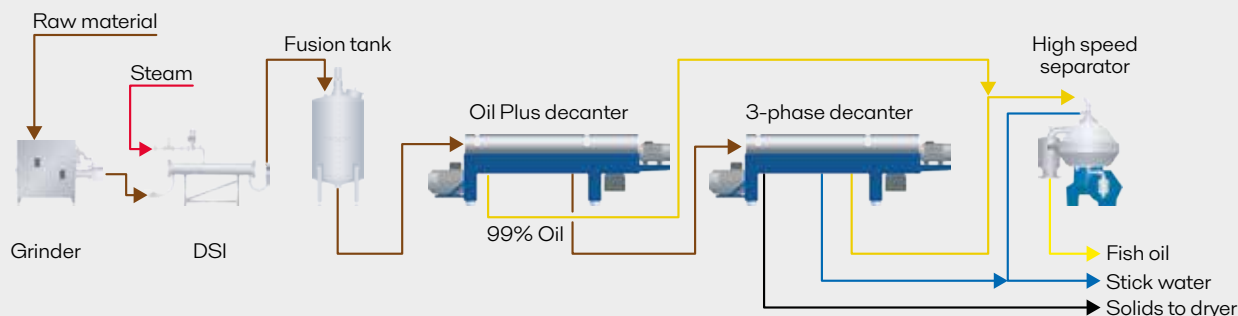
Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Higher oil yield
- Less oil in the dry matter
- Stable operation using an Oil Plus decanter centrifuge
- Less need for peripheral equipment in case of a step for washing.



Fish oil outlet
from Oil Plus



There is no more need of de-oiling tank and associated equipment.

Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Higher oil yield
- Less oil in the dry matter
- Stable operation using an Oil Plus decanter centrifuge
- Less need for peripheral equipment in case of a step for washing.
- Fully CIP line

Upgrade existing or new processing Centriflow lines with the Oil Plus effect

Centriflow line

Wet rendering - whole fish, by-products and crustacean processing

Validated and proven technology, reaching up to 99 Vol.% fish oil. Improving FiDM (Fat in Dry Matter) in the final meal on any wet rendering system, even with high TVN value in raw material.

Oil Plus decanter centrifuges can be installed between the fusion tank and an existing decanter separation installation to maximize oil recovery.

The unique design means Oil Plus decanter centrifuges ensure better de-oiling and higher yield results than any other type of decanter.

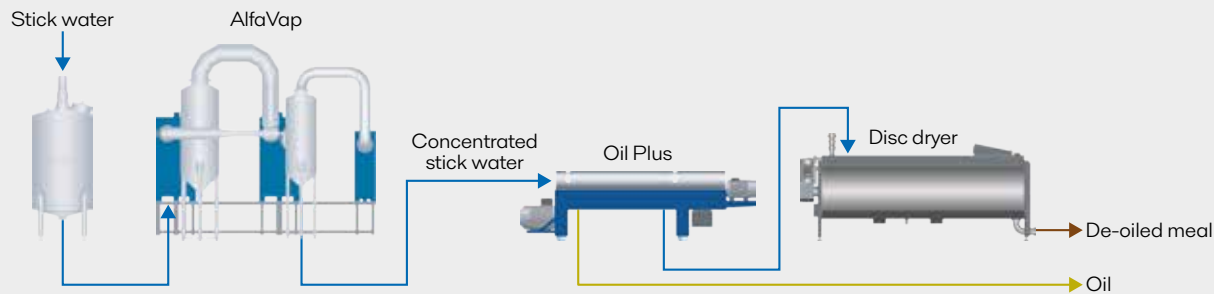
If the impact of discharging, pumping and acceleration into the second decanter releases some additional oil, the use of three phase decanters can recover it.

Slurry from Oil Plus can be directly sent to the second decanter.



De-oiling of concentrate

Stick water and hydrolysate



Stick water from fish contains most of the soluble proteins. Those ones are the most digestible and can improve the total digestibility of the meal together with a lowest oil content.

How it works

During evaporation process, residues of oil present in the stick water will appear more clearly as more water is removed.

Oil content around 4-5% is common, and can increase the final oil content in dried meal.

Oil Plus decanter will remove all free oil from concentrate, allowing a very clean oil phase. Concentrate can be further mixed with solids from standard decanter before dryer or dried directly.

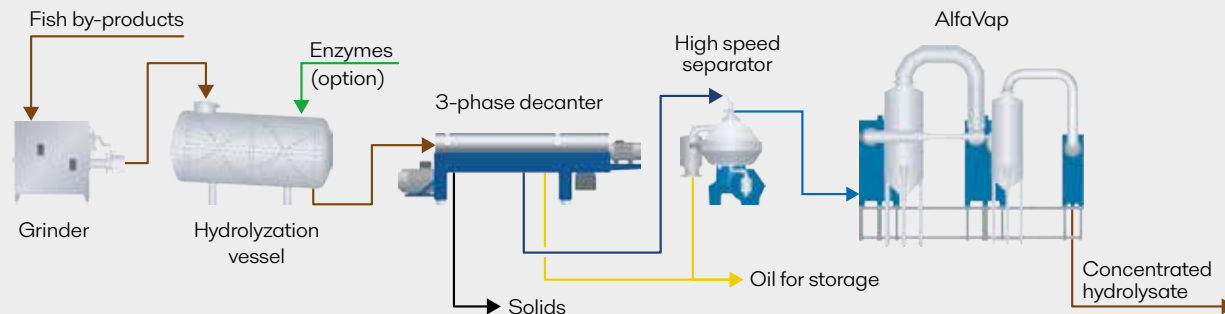
Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Additional oil recovery
- Highest price for meal
- Stable operation with Oil Plus



Fish protein hydrolysate



In fish protein hydrolysate, raw material can be any kind of fish or crustacean (krill, shrimp, etc.) and their by-products. The hydrolyzation can be done via pressure and temperature, natural or artificial enzymes, and acid in a batch cooker or reactor.

The purpose is to dissolve the proteins into the water fraction, depending on the degree of hydrolysis. The quality of the hydrolysis and the separation are very important steps because hydrolyzed protein concentrate increases digestibility and maintains protein functionality.

The purpose is to produce a concentrate (H-FPC) stable enough to be stored or transported, with a long shelf life. This processing method can also reduce energy costs in the production and the use of cold water. A straining device is often used to remove the larger or unhydrolyzed particles before they reach the decanter.

Three-phase decanter centrifuges are often used in this kind of process to get a clarified hydrolysate fraction before concentration in an evaporator. Usually three-phase decanters are used to recover a clear water fraction and clean oil. A clarifier separator is often used after the decanter to remove fine solids particles before concentration.

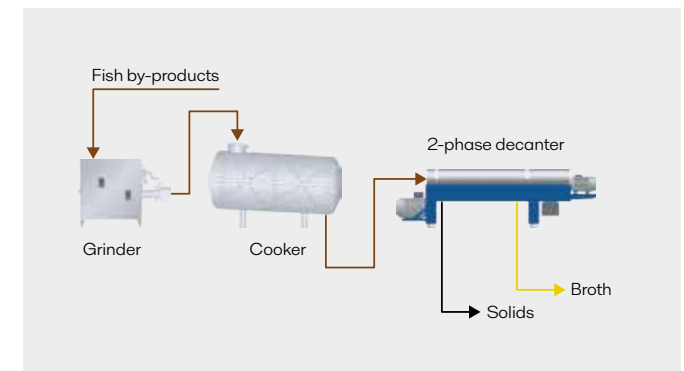
Open outlets with stable interphase will allow for a clean oil and clarified water phase, without oil content, as the water is not pressurized as in other systems.

Oil Plus decanter centrifuges give very good results when operations require the solids and the water fraction to remain together for the concentration step. Due to its specific design, this paves the way to the best possible oil recovery results. Another important consideration is using an Oil Plus decanter to remove oil before hydrolyzation. This method has been proven to recover higher quality oil and simplify the hydrolyzation process.

Fish broth production

Fish broth is often produced with the use of enzymes, with only a combination of temperature and time in a cooker after grinding. Final separation is carried out with a strainer. The disadvantages of such a method are that the strainer does not remove broth from solids, and that a lot of small particles are still present in the broth.

A two- or three-phase decanter centrifuge gives a clear broth with or without an oil phase (depending on whether a two- or three-phase decanter is used). The G-force acting in the decanter dehydrates the solids in the broth, which can then also be reused for other broth production.



Customer benefits

- A clear water fraction due to stable interphase features in the conveyor
- High separation efficiency, high levels of dry matter, and clear oil
- Improved oil quality and degree of hydrolyzation with Oil Plus

Fish silage

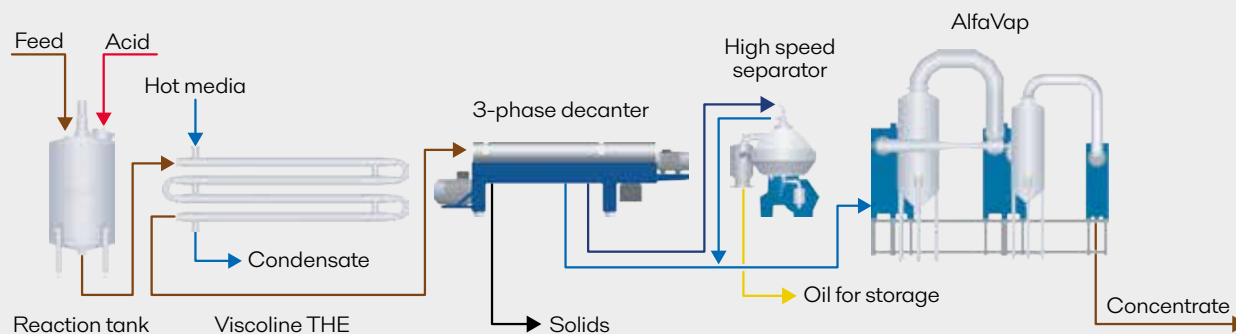
Whole fish and by-products processing

Silage fish plants handle whole fish (from dead fish in aquaculture plants) and by-products from filleting on-site at the processor / aquaculture, which are further processed. The process allows for the passivation of raw material before further treatment via acid hydrolyzation.

How it works

Whole fish and fish by-products from filleting, such as bones, skins and heads are grinded and fed into a reaction or chopper tank, mixed with acid to adapt pH, and left to react for some days.

Due to natural enzymes present in the raw material or with acid injection, hydrolyzation will take place. Protein will dissolve into the water fraction. Oil will be released and finally suspended solids will be present mainly described by sand, calcium (bones) skin material.



During silage formation, proteins will be break down to free amino acids and short chain peptides, so the majority of the proteins become solubilized in the water phase. After some time of processing, only oil, water and minerals solids will remain in the reaction tank.

To separate the three fractions, it is necessary to heat up the product around 90-95°C and then an Alfa Laval decanter three-phases will effectively separate oil, water and solids.

Oil will be further processed through a high-speed separator, meanwhile water will be sent to a plate evaporator AlfaVap for concentration above 50%.

Operating results

Alfa Laval three-phase decaners are commonly used in this process but recent development for maximum oil recovery is to use an Oil Plus decanter associated with a 3-phase decanter.

Alfa Laval offers a specific bowl and conveyor setup in fish silage processing with very good results in solids dryness, and quality of the two liquid fractions (water and oil) due to stable interphase and oil lock baffle disc. This setup avoids any adaptations which are not necessary even with varying feed composition.

Decanter is engineered with focus on lowest possible wear and tear, due to special protection on the bowl and conveyor such as tiles, fully covered feed zone.

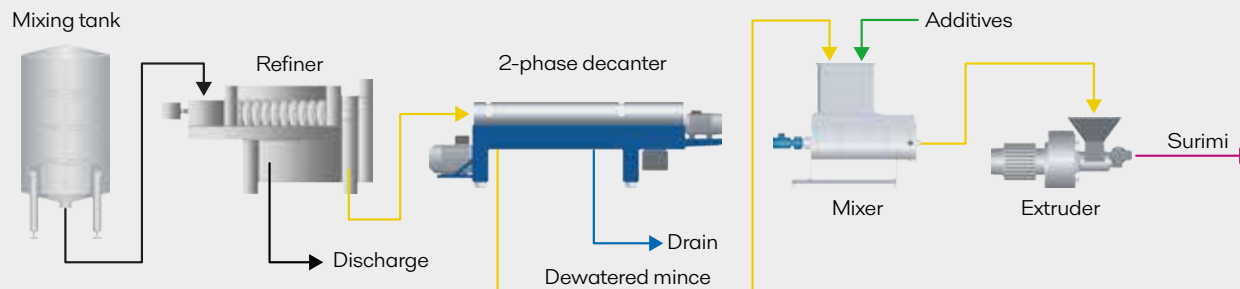
Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Have specifically designed bowl and conveyor to remove mineral solids.
- Stable interphase and open outlets to maximize clear water and oil phase.
- Efficient cleaning and wear protection in acid environment.

Surimi processing

Minced fish



The mixer is equipped with a cooling jacket, which keeps the temperature as low as possible and maintains the high quality of the fish protein. The surimi enters an extruder, which forms the surimi into blocks that are then frozen.

Customer benefits

Using Alfa Laval separation centrifuges equipment and related technologies enables you to achieve:

- Highest level of hygiene inside the decanter unit for premium-grade surimi
- All wetted parts are easily CIP-able
- Conveyor design ensures smooth separation and recovery of a maximum amount of fish proteins
- Can be installed on shore or on board to ensure the best possible access to the fresh raw material
- Stable dryness of dehydrated mince as a result of effective torque control, even when the feed flow or composition varies
- Easy, effective CIP procedures

How it works

To isolate the fish proteins from minced fish, the mince is first mixed with conditioned water in a mixing tank. The washing takes place continuously, with a carefully monitored mince/water ratio. The washed mince is then pumped to a two-phase decanter, where the fish proteins are separated from non-muscle tissue – such as bone, skin, and connective tissue – and other impurities.

For whitefish, the refined slurry is continuously pumped to the decanter centrifuge to separate water and fish mince. If dark-fleshed or fatty fish are being processed into surimi, a second washing stage may be necessary before decanting.

The dewatered mince from the decanter is pumped to a blending system where it is mixed with sugars, sorbitol, and polyphosphates to prevent freeze denaturation.



From fish meal to pharmaceutical production

The operation manager of a mid-sized fish meal plant has witnessed a remarkable transformation in recent years. Initially, the plant had a steady number of customers, with revenues heavily dependent on the whims of the seas. However, the second-generation owners decided to elevate the plant's operations by differentiating their product through the production of much purer fish oil. This new, refined product could be sold as a base to pharmaceutical companies, significantly increasing its value.

With this transformation, maintaining high uptime became crucial. To achieve the highest quality of fish oil, the plant needed to operate seamlessly. Any sudden breakdowns would not only result in lost raw material but also in the loss of a highly valuable end product. Recognizing the importance of uptime, the plant turned to their suppliers, including Alfa Laval, a major partner responsible for multiple pieces of equipment in the process line.

With over 140 years of expertise, Alfa Laval provided the plant with a comprehensive yearly maintenance plan for all critical equipment. This plan included a list of critical spare parts, exclusive stock options, and emergency services. Given the demanding nature of fish processing on equipment, Alfa Laval also scheduled repairs during the off-season, ensuring the plant could start each production cycle with renewed efficiency. Additionally, all these services, along with remote support for unplanned stops, were bundled into a service agreement for easier follow-up and better budget control.



“Uptime is so crucial for us especially after we have started producing high-quality fish oil with the decanter centrifuges. Alfa Laval has been the partner that has lived up to our new and elevated expectations - we can all enjoy our weekends now.”

Operations manager at a fish meal plant in Nordic



Related services

- On-site inspection
- Intermediate service
- Major service
- Gearbox intermediate service
- Conveyor repair
- Bowl repair
- Gearbox major service
- Powerplate upgrade
- Backdrive upgrade
- CIP feed tube upgrade
- Grease retainer upgrade
- CIP bar and nozzle upgrade
- Olsson main bearing upgrade
- PondCtrl™ upgrade
- Rotating assembly
- Spare parts
- Service kits
- Troubleshooting
- Maintenance plan
- Condition assessment
- Service tools
- Operation & maintenance training
- Commissioning
- Replacement
- ConditionAlert™
- Remote support and monitoring
- Inspection in service centre
- Stainless steel frame upgrade

Alfa Laval separators centrifuges

Purifier version [1]

Purification is a process in which a separator is used to **separate two mixed liquids** that are insoluble in each other and have different gravities, with the **lighter liquid constituting the greater part of the mixture**.

It is also possible to separate solids with a higher gravity than liquids simultaneously.

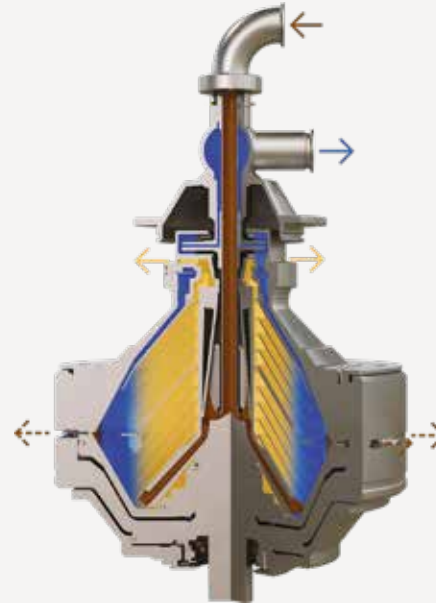
Concentrator version [2]

Concentration is a process in which the machine is used to **separate two mixed liquids** that are insoluble in each other and have different gravities, with the **heavier liquid constituting the majority of the mixture**.

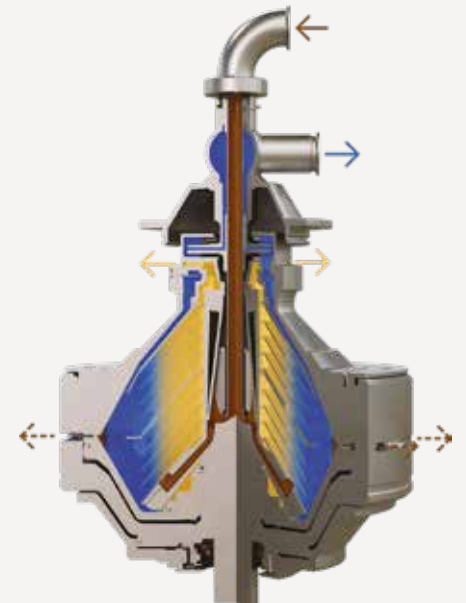
It is also possible to simultaneously separate solids characterized by a higher gravity than liquids. A special concentrator version is the **skimmer [3]** when the light liquid phase is below 5% volume i.e. to de-oil the stick water.

Clarifier version [4]

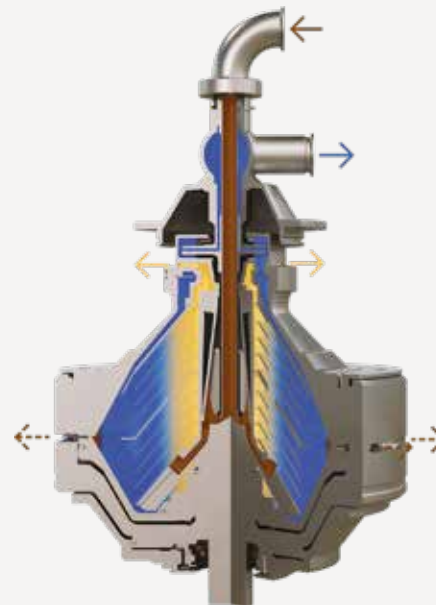
Liquid-solid separation in which the separator is used to **separate particles, usually solids, from a liquid** whose gravity is lower than that of the particles.



[1]



[2]



[3]



[4]

Alfa Laval decanters centrifuges

Two-phase decanter centrifuges [1]

In a two-phase decanter centrifuge, the incoming feed is separated into liquid and solids. The product is fed into the bowl through an inlet tube. Separation takes place in a horizontal cylindrical bowl equipped with a screw conveyor.

Centrifugal force separates the liquid and solids from the feed slurry, making the liquid clarify over the entire length of the cylindrical part of the bowl, while the solids settle on the inner wall of the bowl and leave through the conical section.

Three-phase decanter centrifuges [2]

Those are used to separate an incoming feed mixture into three fractions – oil as light liquid phase, water as heavy liquid phase and solids. Whereas the solids are discharged on the conical end, the two liquid phases exit the bowl at the other end.

Centrifugal force separates the oil, water and solids, making the oil – which has a lower density – accumulate at inner surface, while the heavier liquid (water) clarifies near the bowl wall. Solids settle on the inner wall of the bowl and leave through the conical section.

Oil Plus decanter centrifuges [3]

Oil Plus decanters are intended for dealing with a three-phase suspension, where one discharge phase is for oil only. The working principle is similar to a skimmer. Solids and water are released from the solids outlet in the form of a wet slurry, and oil exits from the cylindrical end.

The incoming feed is effectively separated into oil and wet slurry. The product is fed into the bowl through an inlet tube and is accelerated by the inlet rotor. Separation takes place in a horizontal cylindrical bowl equipped with a screw conveyor that is purpose-built for efficient oil recovery.

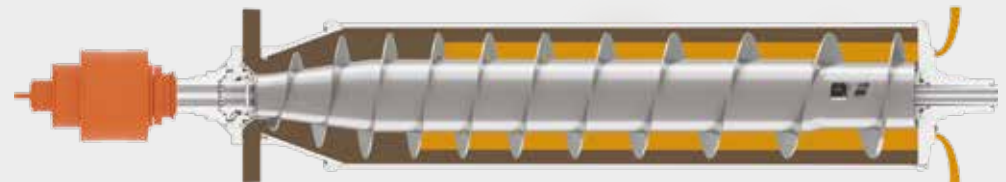
Centrifugal force separates the oil from the feed slurry, making the (lower density) oil accumulate at the liquid surface, while the solids are kept in suspension and are discharged, as a slurry, in the conical end together with the water. Oil extraction takes place along the entire length of the cylindrical part of the bowl.



[1]



[2]



[3]



About Alfa Laval

Alfa Laval is active in the areas of Energy, Marine, and Food and Water, offering its expertise, products, and service to a wide range of industries in some 100 countries.

The company is committed to optimizing processes, creating responsible growth, and driving progress – always going the extra mile to support customers in achieving their business goals and sustainability targets.

Alfa Laval's innovative technologies are dedicated to purifying, refining, and reusing materials, promoting more responsible use of natural resources. They contribute to improved energy efficiency and heat recovery, better water treatment, and reduced emissions.

Thereby, Alfa Laval is not only accelerating success for its customers, but also for people and the planet. Making the world better, every day. It's all about Advancing Better™.

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at **www.alfalaval.com**.

