ANIMAL
BY-PRODUCTS

PIERALISI
CIRCULAR THINKING

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Cod. 318312086 - 05/21

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Animal by-products

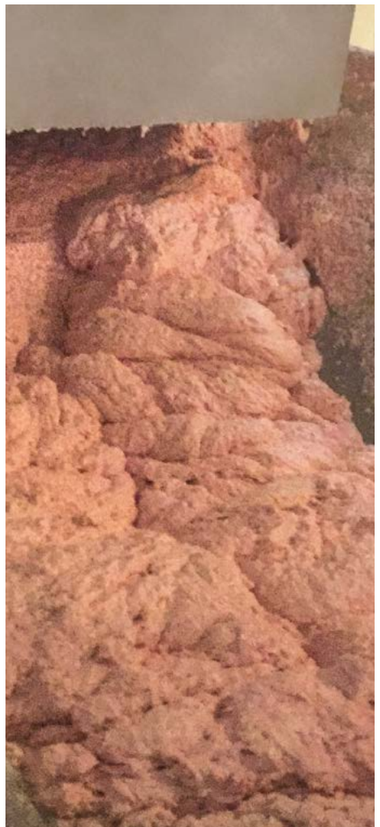
Today the environmental awareness among citizens is steadily growing therefore the processes to reuse and give value to food industry waste become a priority. In this regard, most of animal by-products are convertible from a waste to a market valuable product.

Meat and fish processing waste can be converted in products for pharma, cosmetics and food applications and in other specific products for several non-food applications.

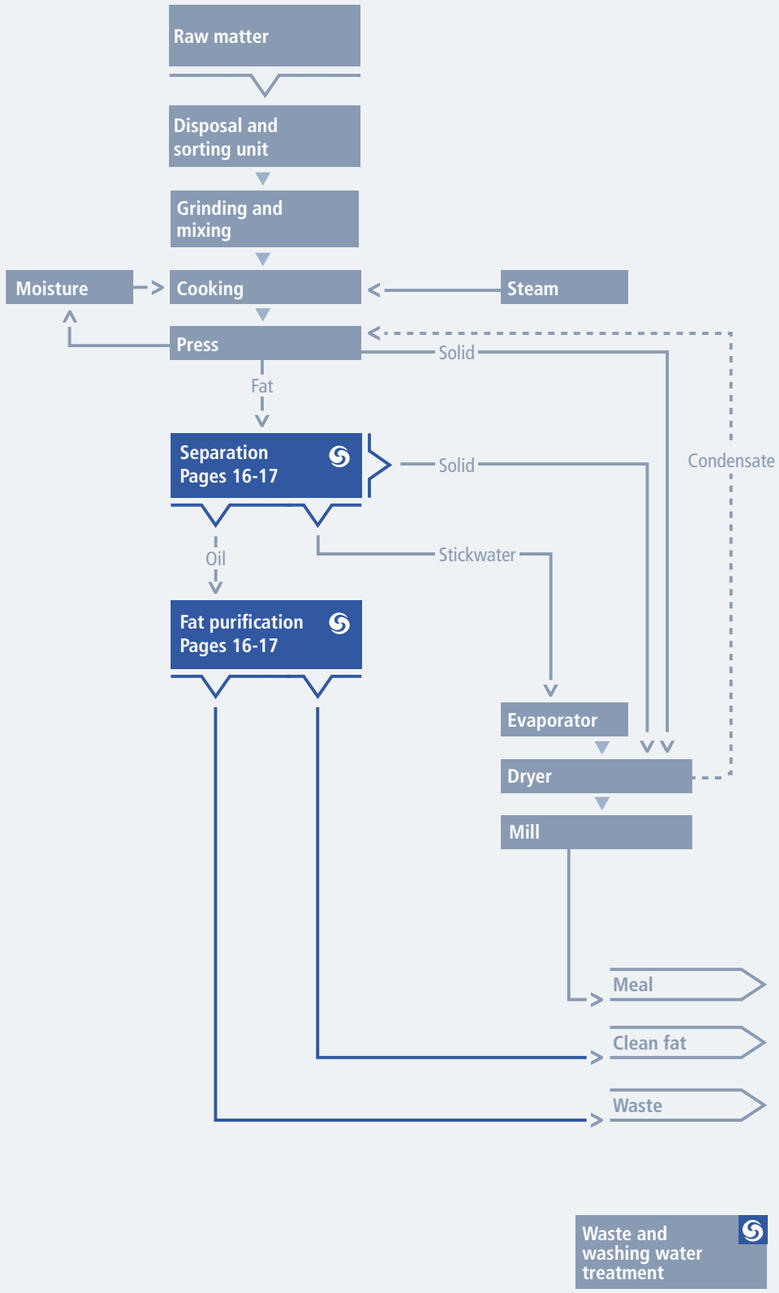
Pieralisi, through its long term experience on this field, is able to supply decanters and centrifugal separators for animal fat rendering, animal meal production, mechanical meat defatting and blood processing.

Our proposed solutions consist of multiple steps of separation, two or three phases, which allow to obtain top quality products, investments cost saving, waste reduction and lower energy consumption.

1 . **Wet Rendering**
2 . **Dry Rendering**
3 . **Blood Plasma Recovery**
4 . **Blood Meal Production**
5 . **Fish Oil Recovery**
6 . **Meat Oil Recovery**
7 . **Mechanical Meat Defatting**



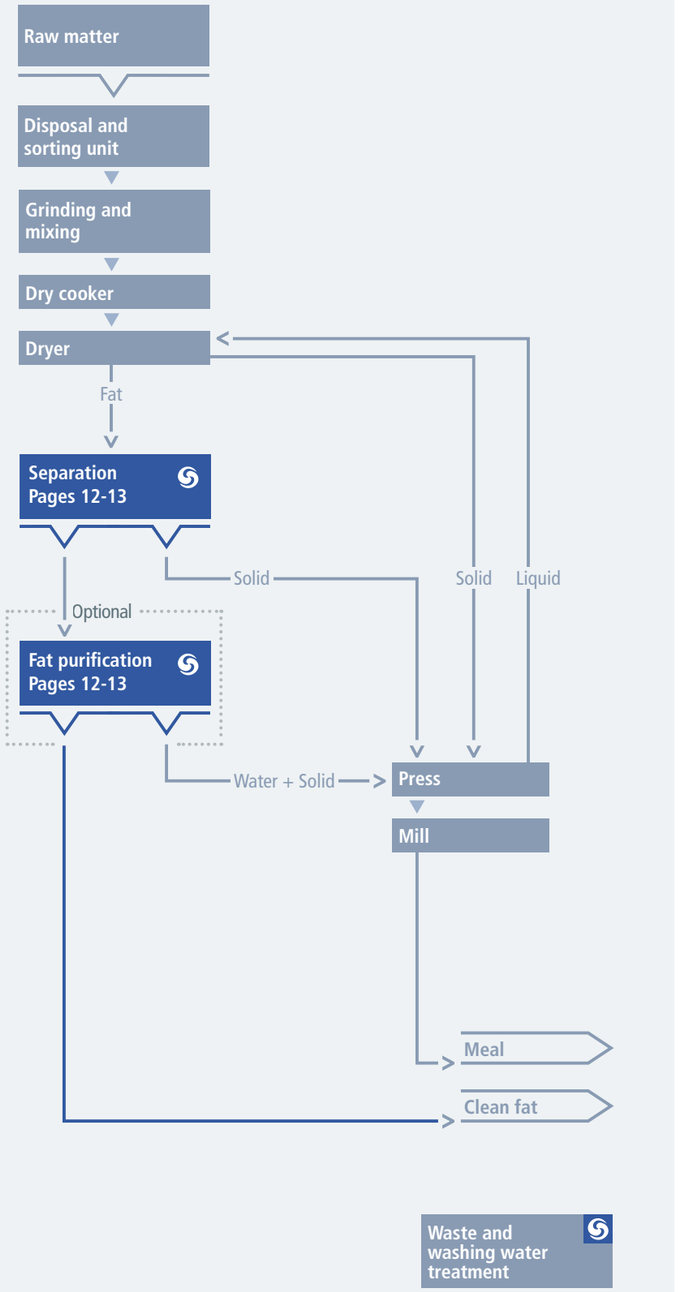
1 Wet Rendering



Process section involving Pieralisi technologies

Example of process flow diagram

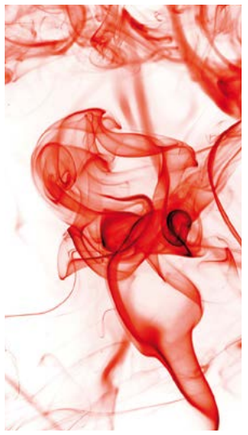
2 Dry Rendering

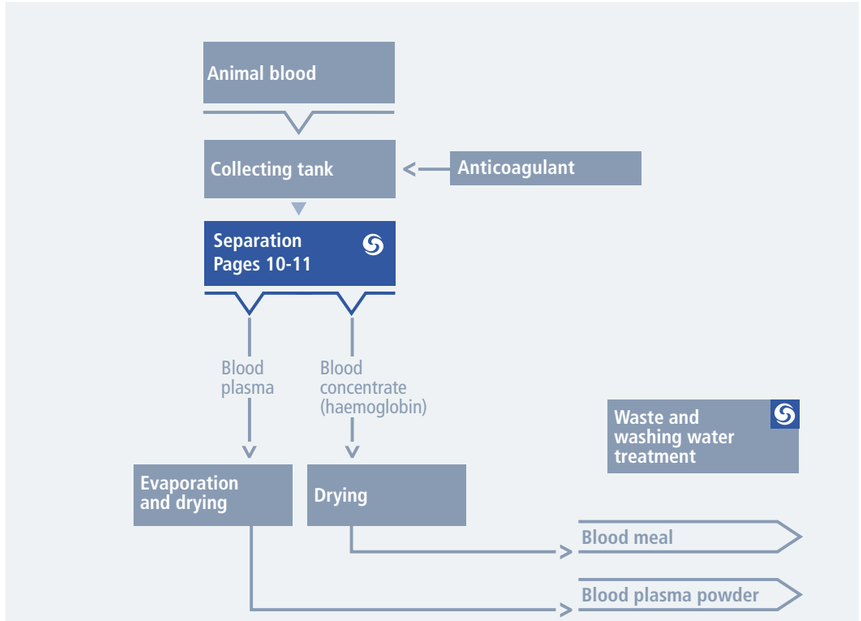


Process section involving Pieralisi technologies

Example of process flow diagram

3 Blood Plasma Recovery

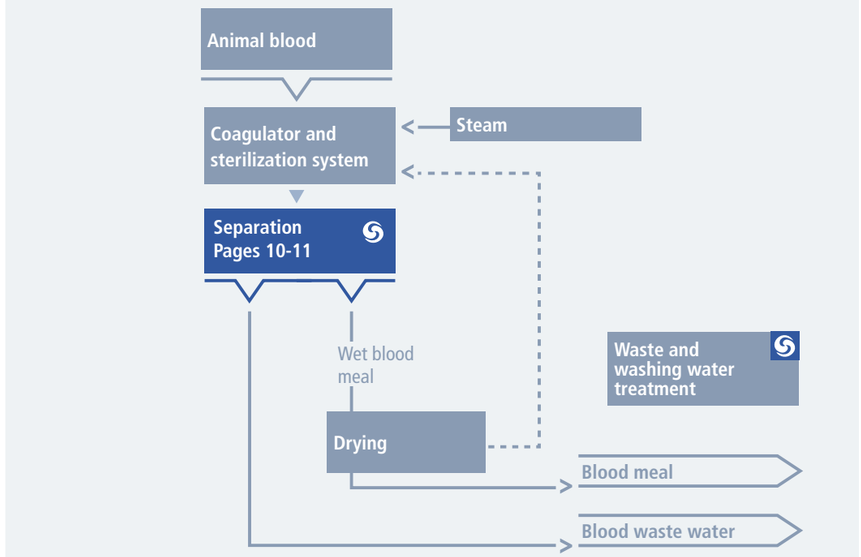




Process section involving Pieralisi technologies

Example of process flow diagram

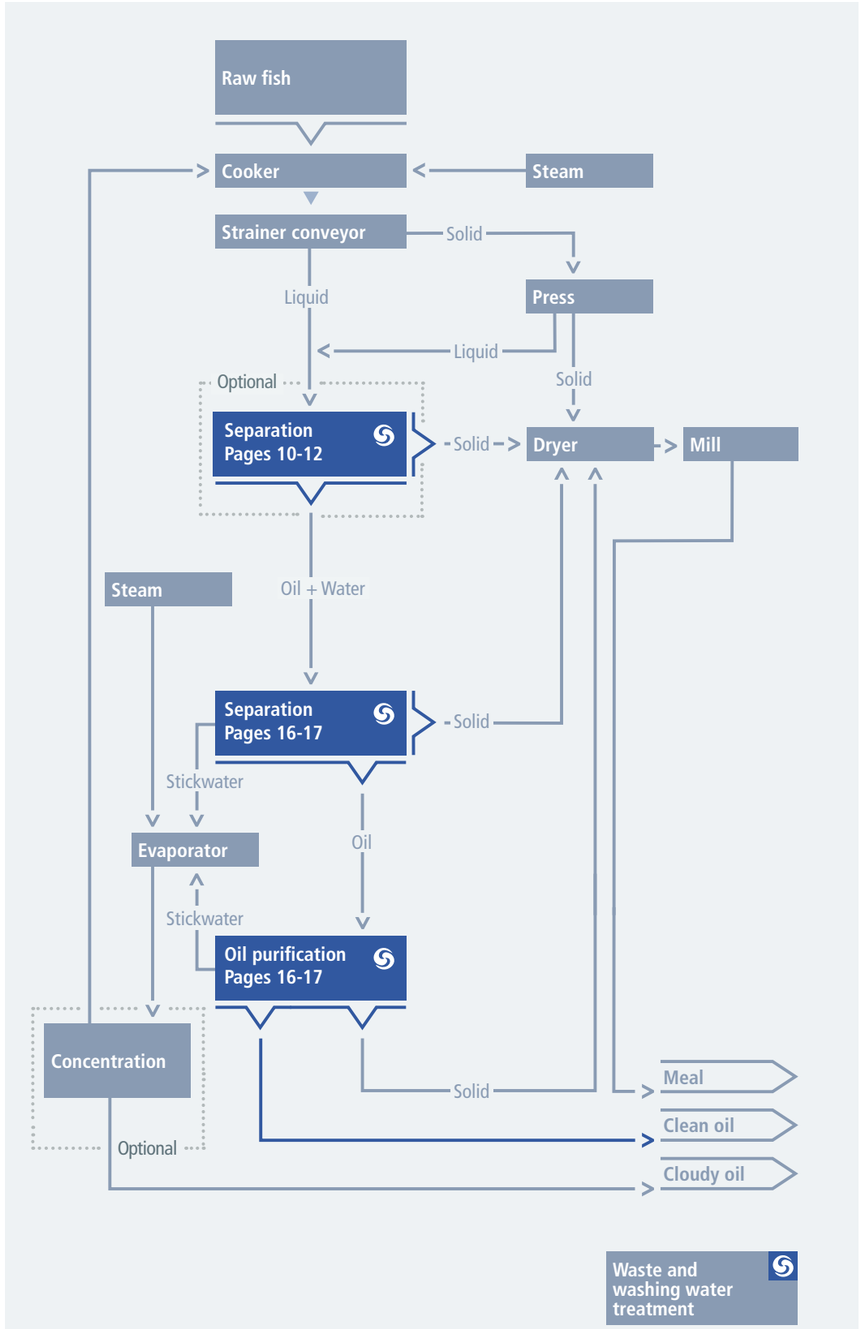
4 Blood Meal Production



Process section involving Pieralisi technologies

Example of process flow diagram

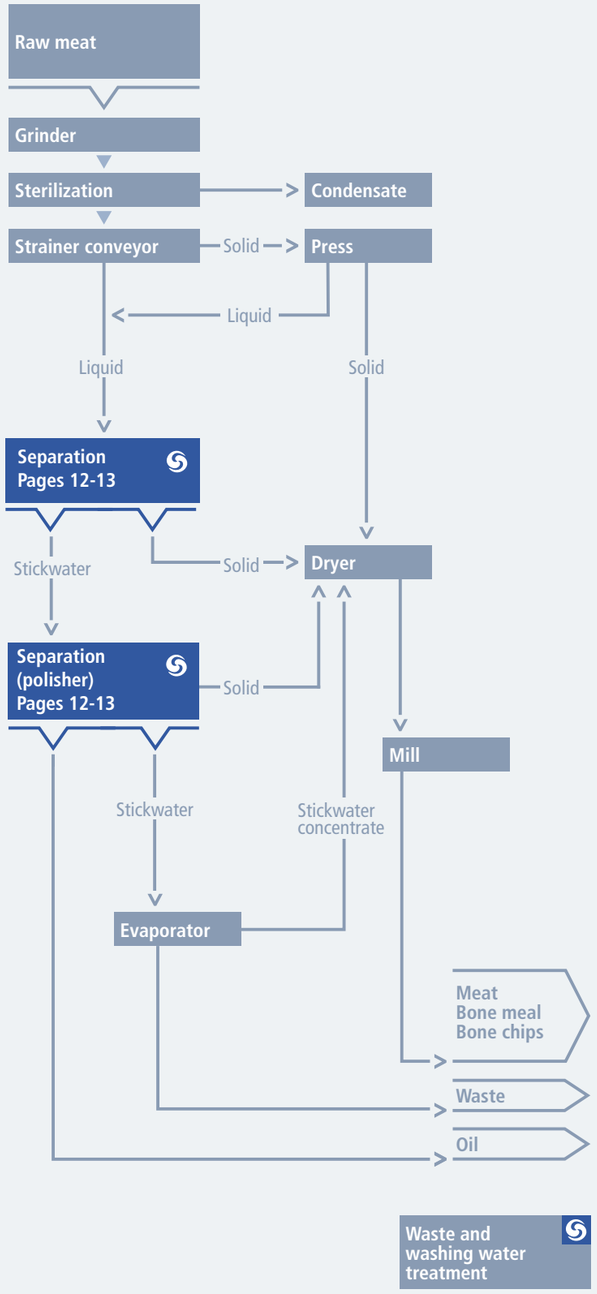
5 Fish Oil Recovery



Process section involving Pieralisi technologies

Example of process flow diagram

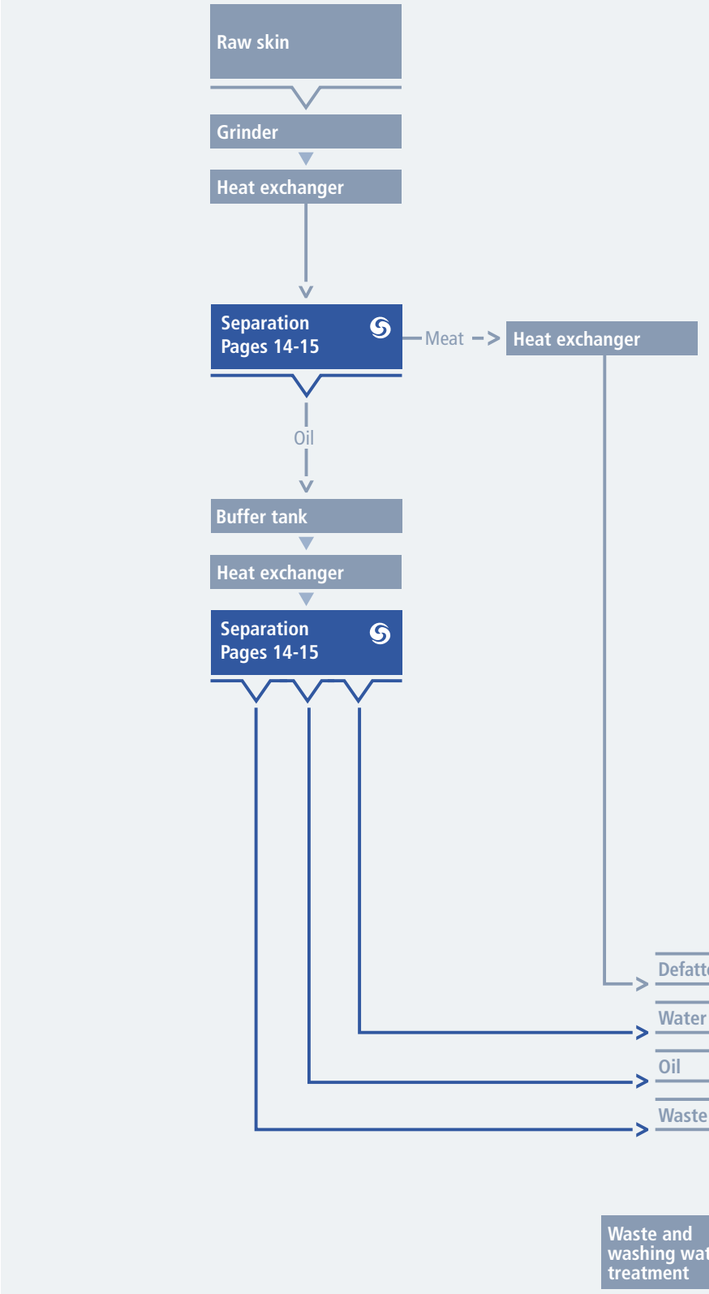
6
Meat Oil Recovery



Process section involving Pieralisi technologies

Example of process flow diagram

7
Mechanical Meat Defatting



Process section involving Pieralisi technologies

Example of process flow diagram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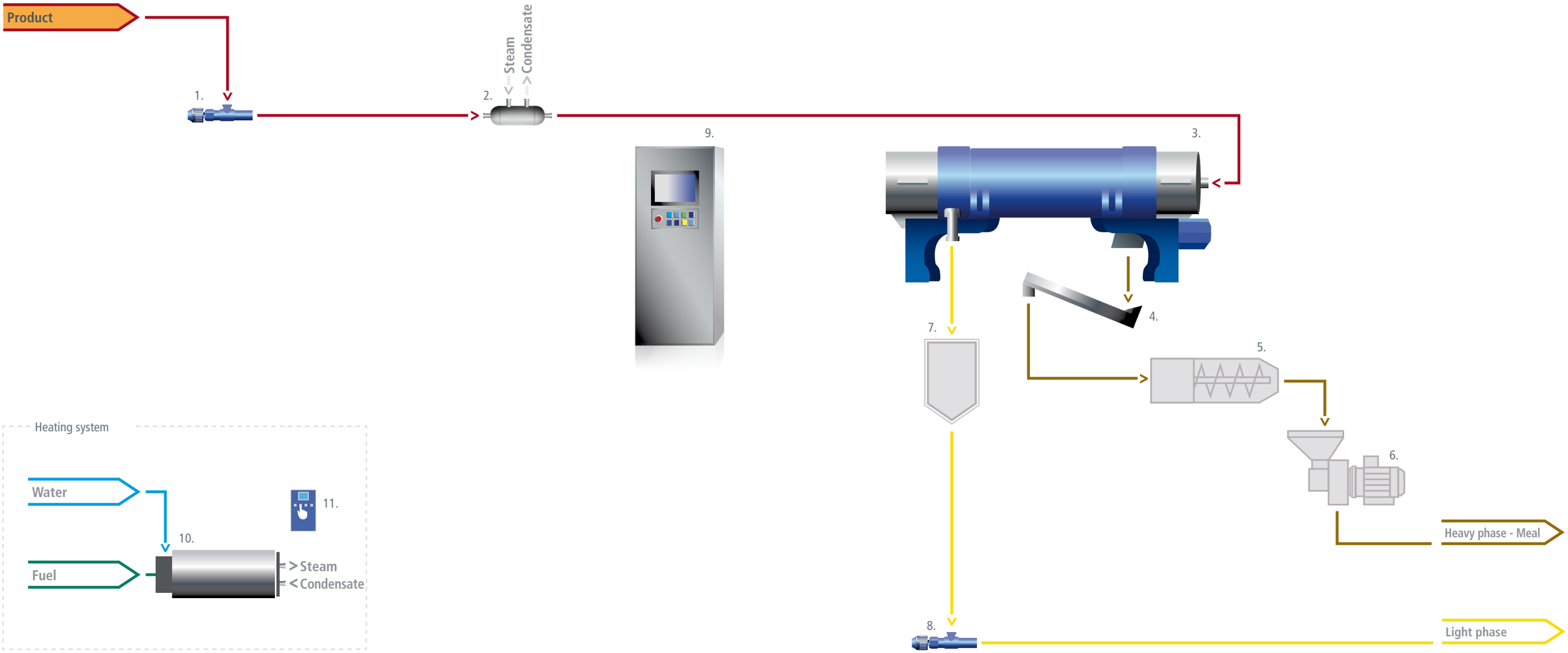
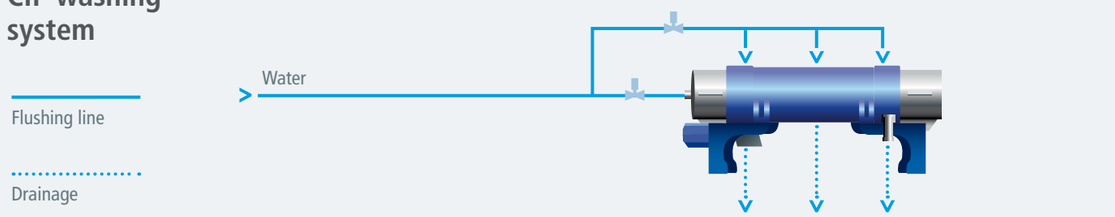
Single Step 2 Phases



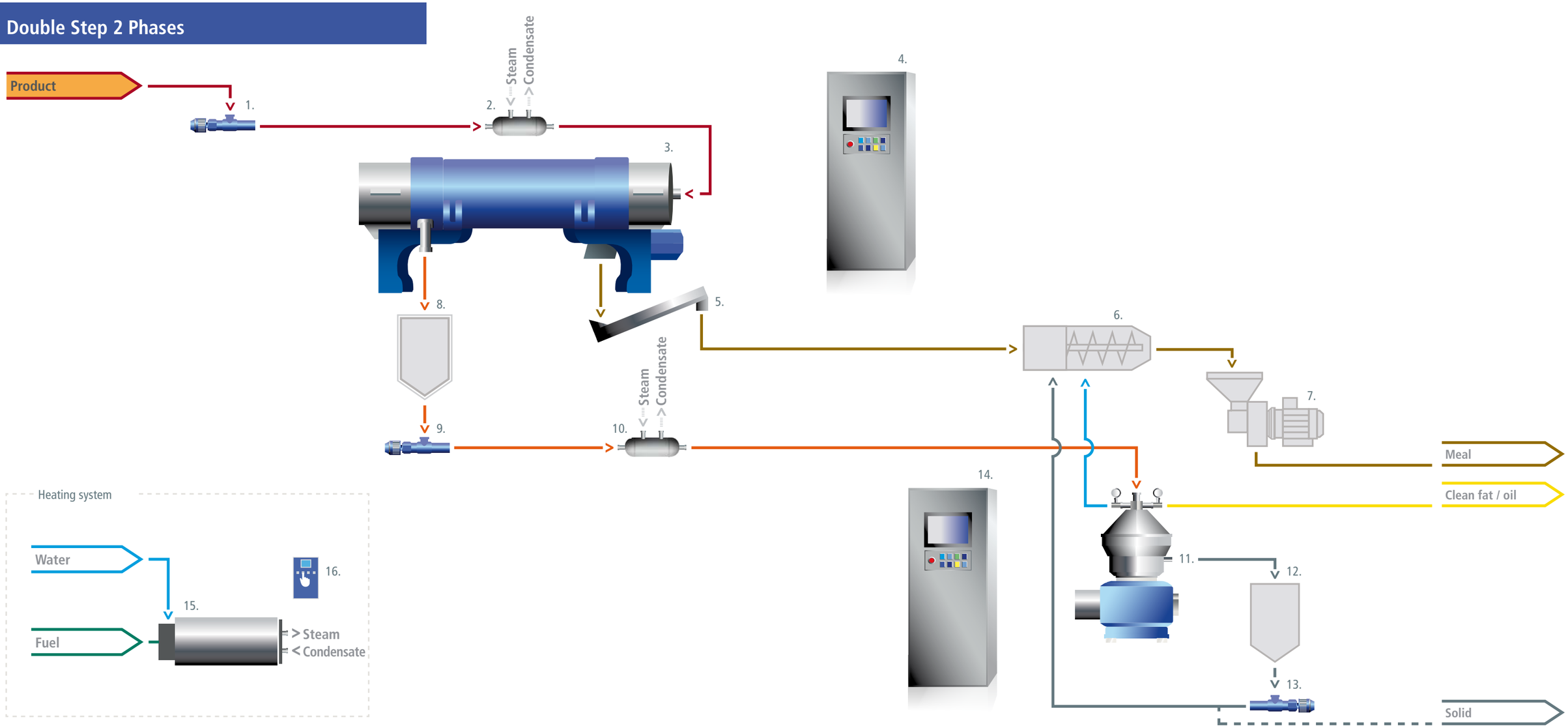
This configuration includes the following pieces of equipment:

1. Product pump
2. Heat exchanger
3. Decanter centrifuge
4. Screw conveyor
5. Press
6. Mill
7. Light phase tank
8. Light phase pump
9. Main control panel
10. Steam generator
11. Heating system control panel

CIP washing system



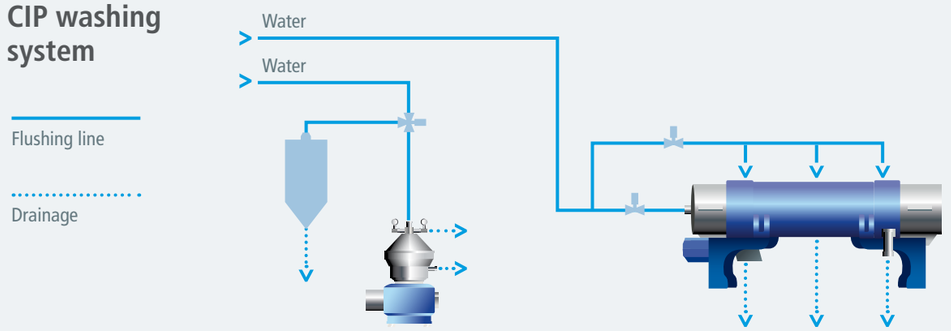
Double Step 2 Phases



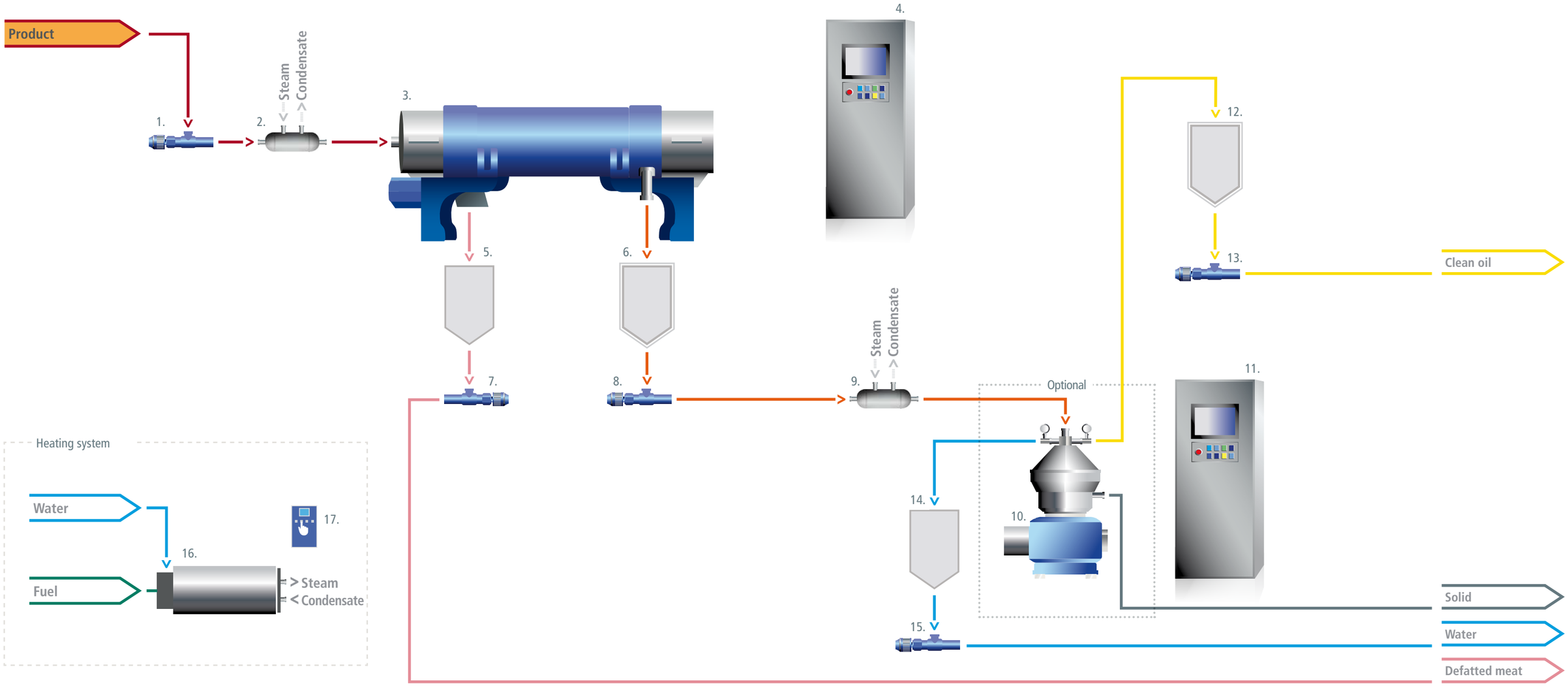
This configuration includes the following pieces of equipment:

1. Filter
2. Heat exchanger
3. Decanter centrifuge
4. Decanter centrifuge control panel
5. Screw conveyor
6. Press
7. Mill
8. Fat / oil tank
9. Feeding pump
10. Heat exchanger
11. Centrifulgal separator
12. Solid discharge tank
13. Solid discharge pump
14. Centrifulgal separator control panel
15. Steam generator
16. Heating system control panel

CIP washing system



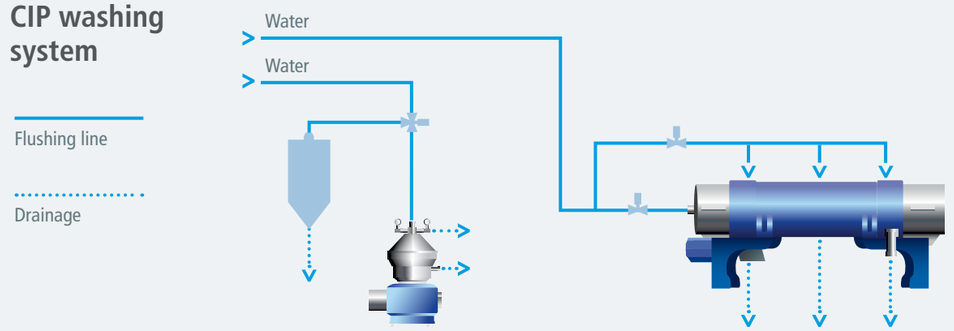
Double Step 2 Phases (Mechanical Meat Defatting)



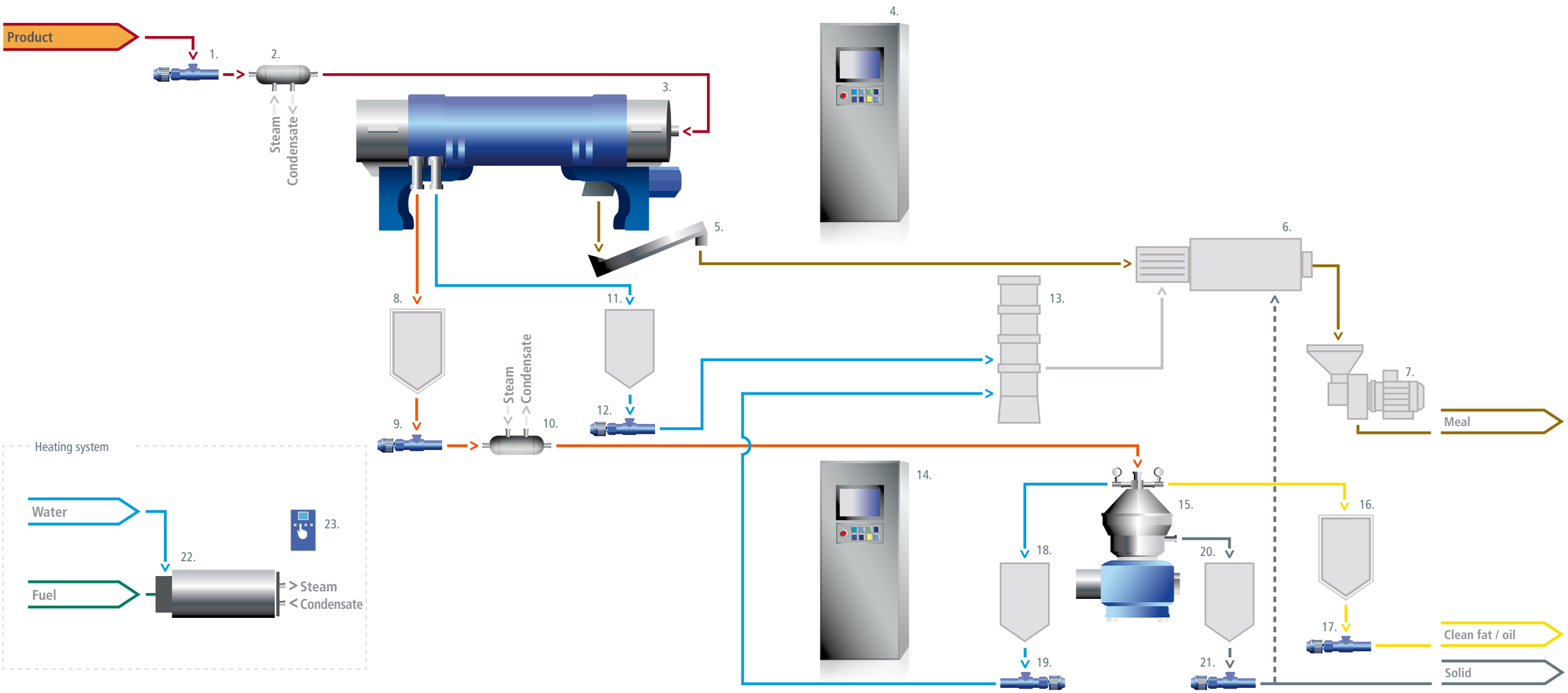
This configuration includes the following pieces of equipment:

1. Product pump
2. Heat exchanger
3. Decanter centrifuge
4. Decanter centrifuge control panel
5. Defatted meat tank
6. Oil phase tank
7. Defatted meat pump
8. Centrifugal separator feeding pump
9. Heat exchanger
10. Centrifugal separator
11. Centrifugal separator control panel
12. Clean oil tank
13. Clean oil pump
14. Clean water tank
15. Clean water pump
16. Steam generator
17. Heating system control panel

CIP washing system



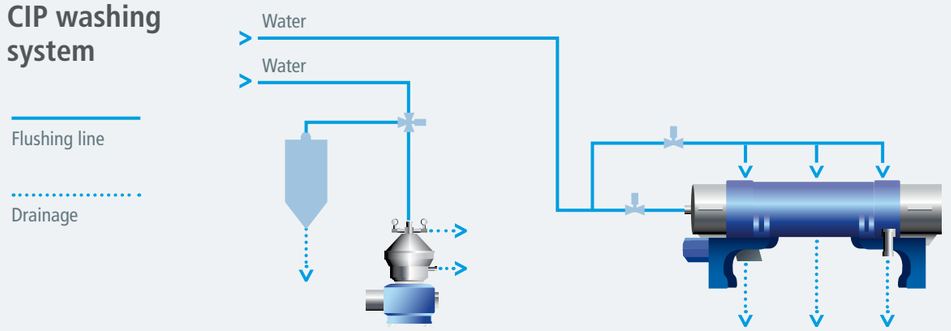
Double Step 3 Phases



This configuration includes the following pieces of equipment:

1. Product pump
2. Heat exchanger
3. Decanter centrifuge
4. Decanter centrifugal control panel
5. Screw conveyor
6. Dryer
7. Mill
8. Fat oil tank
9. Fat oil pump
10. Heat exchanger
11. Stickwater tank
12. Stickwater pump
13. Evaporation plant
14. Centrifugal separator control panel
15. Centrifugal separator
16. Clean fat / oil tank
17. Clean fat / oil pump
18. Water tank
19. Water pump
20. Solid discharge tank
21. Solid discharge pump
22. Steam generator
23. Heating system control panel

CIP washing system

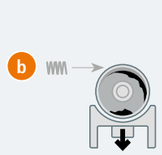


Decanter centrifuge

Pieralisi decanter centrifuges are based on a modern technology that combines the ability of treating high solids content products with an excellent clarification efficiency. Separation performances are related not only to mechanical details but also to operating parameters (centrifugal force, flow rate, differential speed, liquid levels) and to the specific characteristics of the product (density, viscosity, quantity and dimension of solid particles).
A main motor, connected to the decanter shaft, drives the bowl rotation. The extremely high centrifugal force generated inside the bowl is proportional to the rotational speed and to the bowl diameter. The product to be clarified enters through the feeding pipe, it passes in the diffuser to be distributed at the centre of the bowl and then it is accelerated. The centrifugal force acting on the solid particles is responsible for the solid-liquid separation.
Every decanter centrifuge can be tailored to any specific application, selecting between the different available configurations, components and devices. Two or three phases liquid discharge configuration (a) and the solid scraper (b) are some of the most common systems available in animal by-products.

Solid scraper device

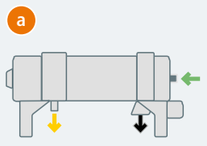
The dehydrated solid that is stockpiled on the bowl internal walls, is transported by a scroll and continuously emptied towards the opposite side to the liquid exit.
In order to avoid the dehydrated solid accumulation and to guarantee a regular discharge, a specific device (solid scraper) can be installed in the solid chamber. This device is automatically activated on the base of the parameters set by the operator on the control panel.



Liquid discharge configurations

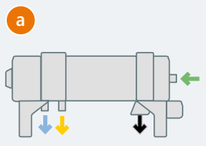
Two phases discharge

- Inlet product
- Solid phase — free exit
- Liquid phase — free exit



Three phases discharge

- Inlet product
- Solid phase — free exit
- Heavy liquid phase — free exit
- Light liquid phase — free exit



Interchangeable liquid discharge outlets and levels

Centrifugal separator

Pieralisi vertical centrifuges represent the perfect technological solution to complete the separation process done with horizontal decanters.
Vertical separators, taking advantage of their extremely high rotational speed, can reach centrifugal force values up to 10.000 g, far higher than decanters can reach. This very high centrifugal force is the key element that allows the separators to remove the solid particles that have not been grabbed in the previous separation steps, generating a highly pure clarified liquid. In addition the attainable performances are linked to many factors, both structural (disc type and design, inside volumes, liquid discharge levels and devices) and operational (flow rate, characteristic of the product, solid quantity and type, temperature).
Pieralisi centrifugal separators are specifically developed to reach the maximum quality levels by using internal components designed to remove also the smallest solid particles.
The product to be clarified enters into the top of the separator through the feeding tube, it is undergone to centrifugal force and then it is forced to pass through the hundreds of internal discs.
The combined action of the centrifugal force together with the presence of the internal discs leads to the separation of the solid particles that are deposited on the bowl wall, where these are discharged in an automatic and intermittent way. The clarified liquid centrally climbs back towards the top of the bowl and it continuously exits through free liquid outlet.

Two liquid phases discharge

- Inlet product
- Light phase — free exit
- Heavy phase — free exit

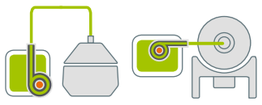
Electrical and control panel

"Pieralisi Control System" is divided in two main sections: power and control. The main switches and the variable frequency drives (VFD) for both decanter, separator and auxiliaries are placed in the power side. The control module is based on the latest generation PLC and HMI with a touch screen panel. A dedicated software, designed by Pieralisi automation department, is embedded in the PLC to automatically control the whole separation plant during each operating phase: start-up, duty, flushing, shutdown and emergency.
The HMI allows navigating through several areas:

- separation process monitoring
- operating parameters control
- alarms detection and interlocks
- main parameters trend display

The last control release optimizes the separation performances and stabilizes the operation conditions by controlling the **decanter centrifuge** in "torque mode". The logic is continuously calculating the torque on the decanter scroll, keeping it stable at its set point value, by smoothly acting on the scroll differential speed.
The PLC automatically handles and controls the **centrifugal separator** in each operating step (start-up, duty, discharge, flushing and shutdown), monitors the main parameters and effectively manages any anomaly or emergency.
All Pieralisi control panels can be equipped with a dedicated module suitable for remote connection, supervision, diagnostics and support.
Upon request, only the control unit (TCP) can be supplied: this solution does not consider the possibility to control the auxiliaries and does not have the electrical section with VFD and breakers.

Feeding pump

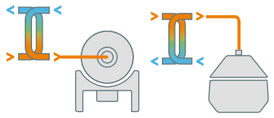


Ensures constant and automatically adjustable flow to the separator inlet.

Homogenizing system

Homogenizes the temperature and the solid particles content of the inlet product.

Heating system

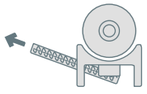


Regulates the temperature of inlet product.

Electric and control panel

Permits the monitoring and the regulation of power, process parameters and safety devices.

Solid conveying system



Manages the solid transportation from the decanter discharge to the storage area.

CIP washing system

Preparation for the washing and automatic cleaning of the separation unit.

Configuration Table

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Decanter Centrifuge

			Wet Rendering	Dry Rendering	Blood Plasma Recovery	Blood Meal Production	Fish Oil Recovery	Meat Oil Recovery	Mechanical Meat Defatting
			1	2	3	4	5	6	7
ROTATING ASSEMBLY	Bowl	Shallow cone							
		Inner surface with grooves							
		Wear protections solid discharge bushings AISI 440C (replaceable)							
		Wear protections solid discharge bushings Stainless Steel (replaceable)							
	Scroll	Single flight (S), Reduced pitch (R), Variable pitch (V), Double flight (D)							
		Flight with windows							
		Flight wear protections: sprayed tungsten carbide							
		Diffuser replaceable wear protection: AISI 440 or STC							
MATERIALS	Bowl and scroll	AISI 414 stainless steel / AISI 304 stainless steel							
		SAF 2205 Duplex stainless steel / AISI 316 stainless steel							
	Case	Cylindrical body: Painted carbon steel (PCS), Stainless steel (SS)							
		Stainless steel solid-liquid chambers							
		Subframe: Painted carbon steel (PCS), Stainless steel (SS)							
	Parts in contact with the product	Stainless Steel							
		Tailored on the application and the international European standards							
EXECUTION	Installation area	Safe area; No Hazardous area							
LUBRICATION	Gearbox	Oil barth (tailored on the FDA specification)							
	Bearings	Automatic greasing (grease tailored on the FDA specifications) ▶02							
PROCESS CONFIGURATION	Liquid process handling	Two phases ▶04							
		Three phases ▶03							
		Interchangable liquid outlet levels							
DRIVES	Bowl drive	Electric motor							
	Scroll drive	Fixed differential speed (countershaft)							
		Electric motor (BD), Rotovariator (RTV), Hydraulic motor (SH)							
DECANTER OPTIONS	Kits and systems	Electric control panel							
		Cooling fan							
		Solids scraper device ▶01							
		Cyclone kit							
		CIP washing system							
PLANT OPTIONS	Kits and systems	Filtering unit							
		Solid conveyor system							
		Homogenizing system							
		Feeding pump							
		Flow rate measurment kit							
		Heating system							

Centrifugal Separator

PROCESS CONFIGURATION	Liquid discharge	Double outlet free exit ▶05							
		Single outlet under pressure (TL, TH), double outlet under pressure (2T)							
	Solid discharge	Automatic							
	Type of separation discs	Clarifier (CL), Purifier (P)							
MATERIALS	Bowl	SAF 2205 Duplex							
	Cover	AISI 304 stainless steel							
	Frame	Cast iron with stainless steel inner protection							
	Wet parts	Tailored on the application and international standard							
		Tailored on the application and the international European standards							
PROTECTION	Gaskets	High wear and corrosion resistence							
	Seal	With wear and corrosion spacial protection system							
TRANSMISSION	Type	Gears (G), Belts (B)							
	Lubrication	Oil bath (tailored on the FDA specifications)							
		Oil with forced circulation cooling system							
INSTALLATION	Area	Safe area; No Hazardous area							
	Type	Stand alone separator, equipped with shock abosorbers and anchor devices							
		Stainless stell skid and anchor devices							
		Stainless stell skid equipped with control panel and auxiliary units							
SEPARATOR OPTIONS	Kits and systems	Control panel							
		Activation of the solid discharge: manual (M) or automatic (A)							
		Counter pressure valve on light (L), heavy (N) or both liquid outlets (LH)							
		CIP washing system							
PLANT OPTIONS	Kits and systems	Filtering unit							
		Feeding pump							
		Flow rate measurment kit							
		Heating system