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PIERALISI
CIRCULAR THINKING

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Cod. 318312084 - 05/21

FRUIT
AND VEGETABLES

PIERALISI
CIRCULAR THINKING

Fruit and vegetables

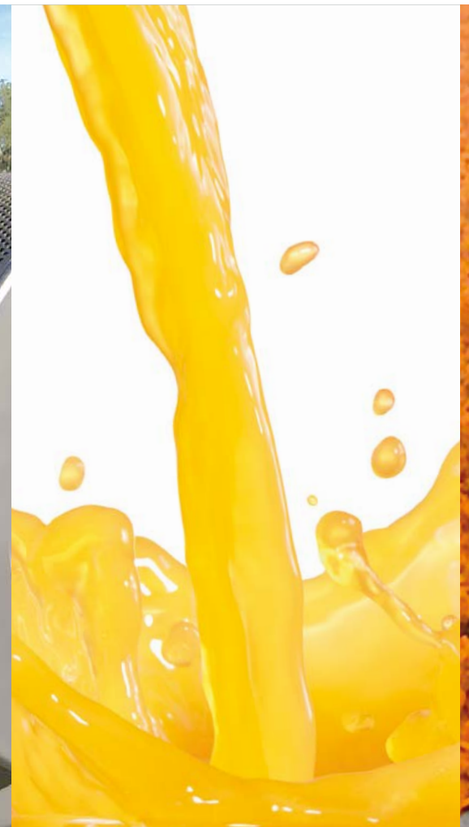
Juices extracted from fruit and vegetable are vital to hydrate and keep our body healthy. They enable the preservation of corporeal pH, the prevention of disorders and diseases.

The choice of raw material is as important as the necessary technologies for processing and obtaining high quality products.

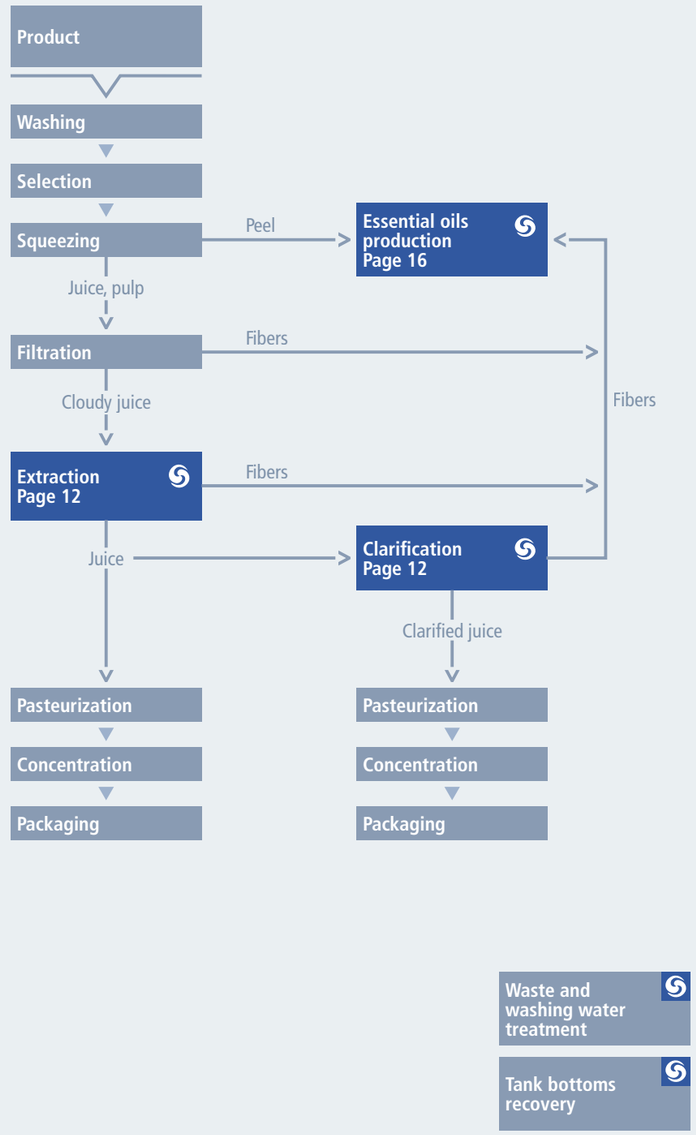
The great experience, acquired over the years from Pieralisi, offers a wide range of solutions for the extraction of fruit or vegetable juices and purée, granting the best nutritional quality of the finished product.

Our wide range of separators and decanters perfectly fits to any kind of raw material, both fruit and vegetable, and to any kind of production process.

1 . **Citrus fruit juice**
2 . **Essential citrus fruit oils**
3 . **Apple and pear juice**
4 . **Peach, apricot, prune, kiwi juice**
5 . **Berry juice**
6 . **Mango, guava, papaya, lychee juice**
7 . **Tomato and carrot juice**
8 . **Grape juice**
9 . **Pineapple juice**



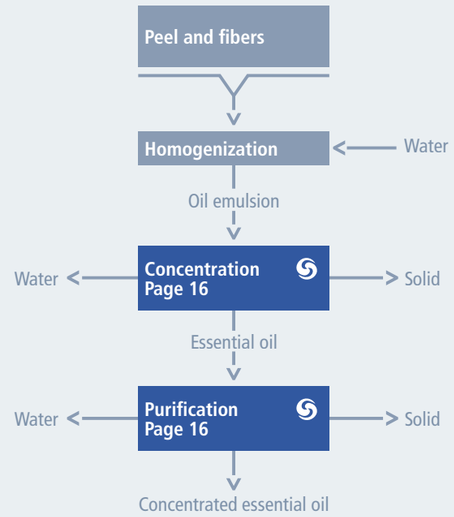
1 Citrus fruit juice



Process section involving Pieralisi technologies

Example of process flow diagram

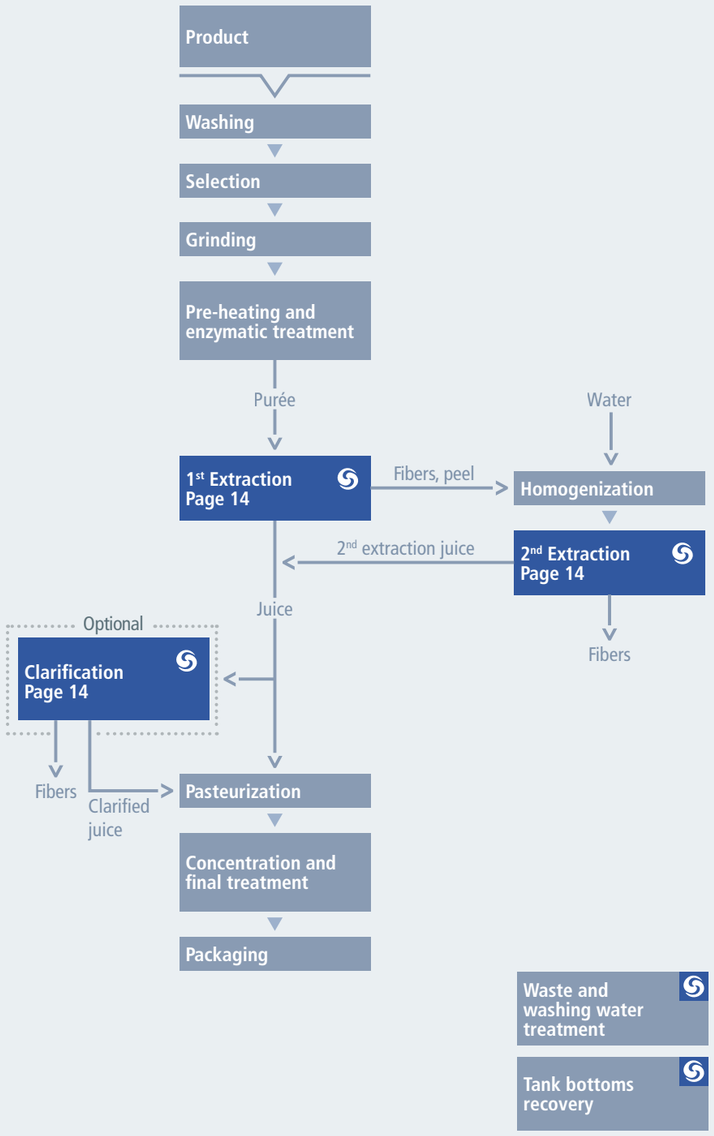
2 Essential citrus fruit oils



Process section involving Pieralisi technologies

Example of process flow diagram

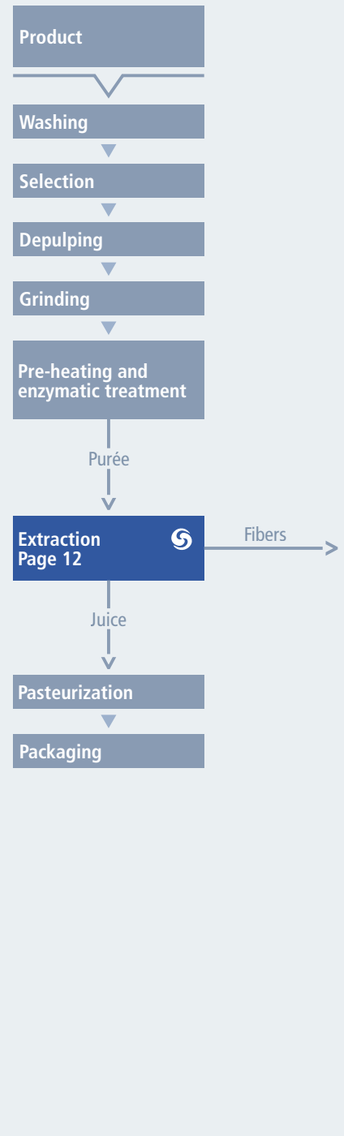
3 Apple and pear juice



Process section involving Pieralisi technologies

Example of process flow diagram

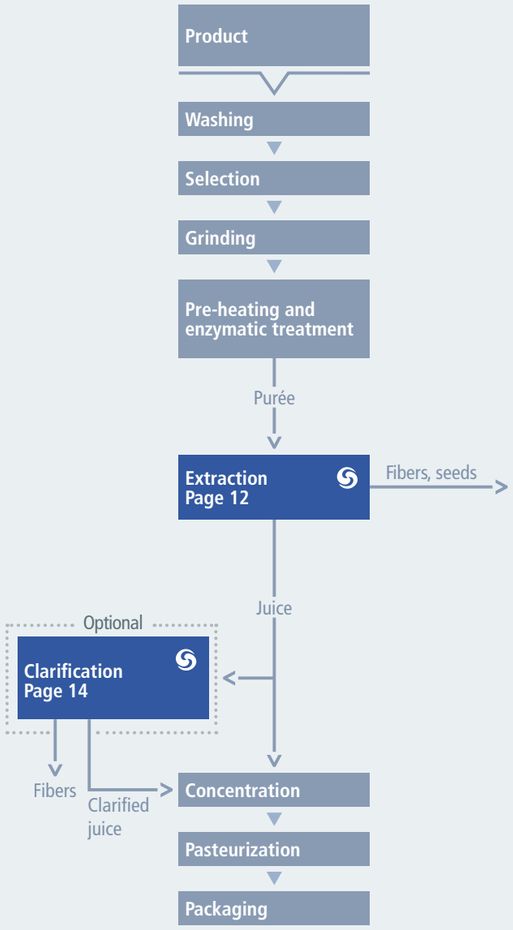
4 Peach, apricot, prune, kiwi juice



Process section involving Pieralisi technologies

Example of process flow diagram

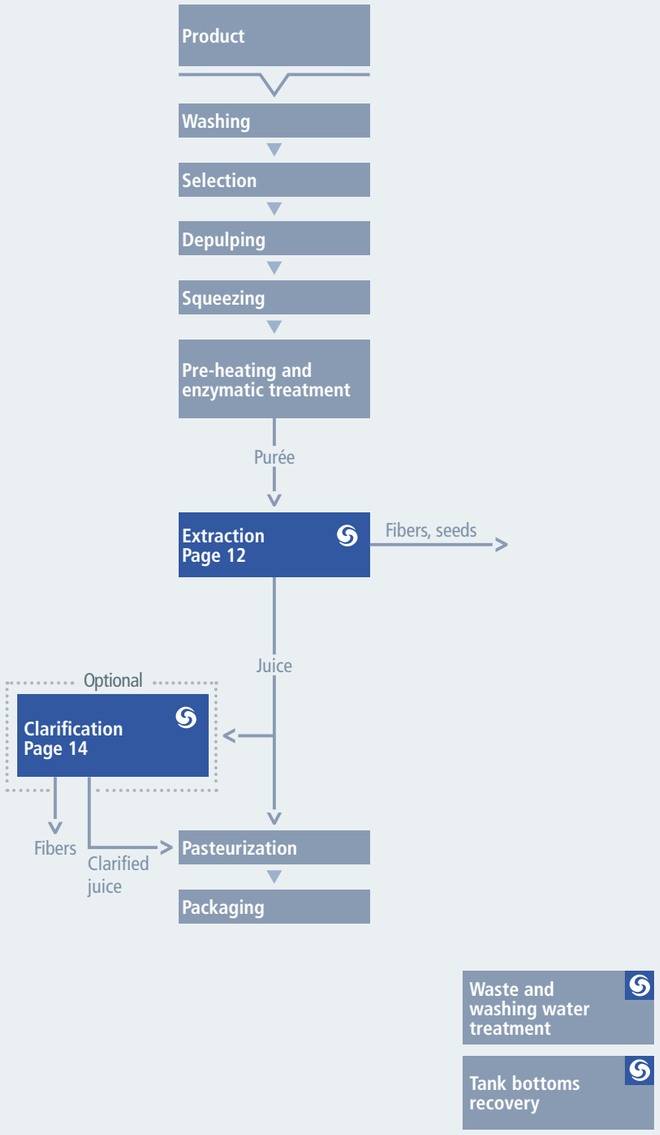
5
Berry juice



Process section involving Pieralisi technologies

Example of process flow diagram

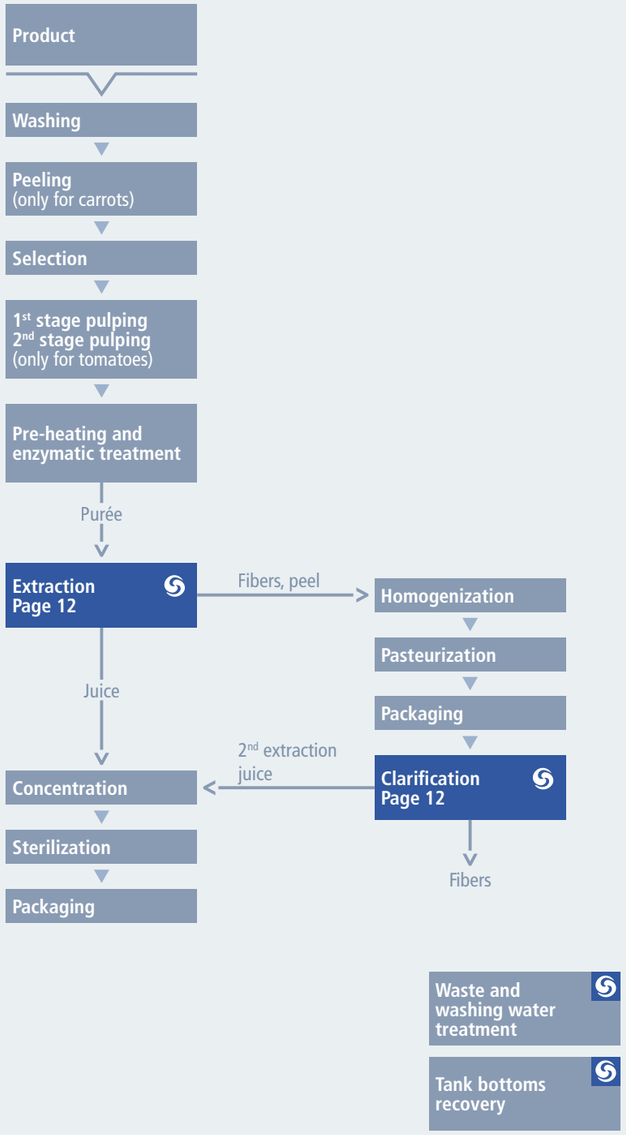
6
Mango, guava, papaya, lychee juice



Process section involving Pieralisi technologies

Example of process flow diagram

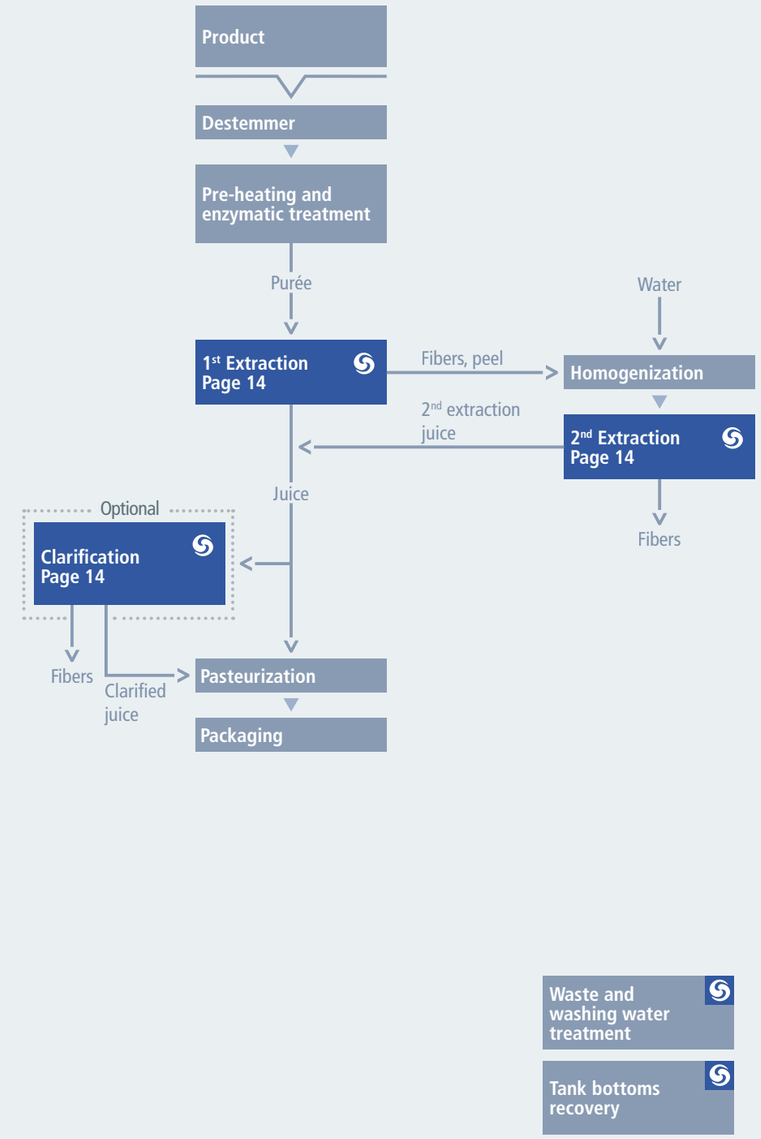
7 Tomato and carrot juice



Process section involving Pieralisi technologies

Example of process flow diagram

8 Grape juice

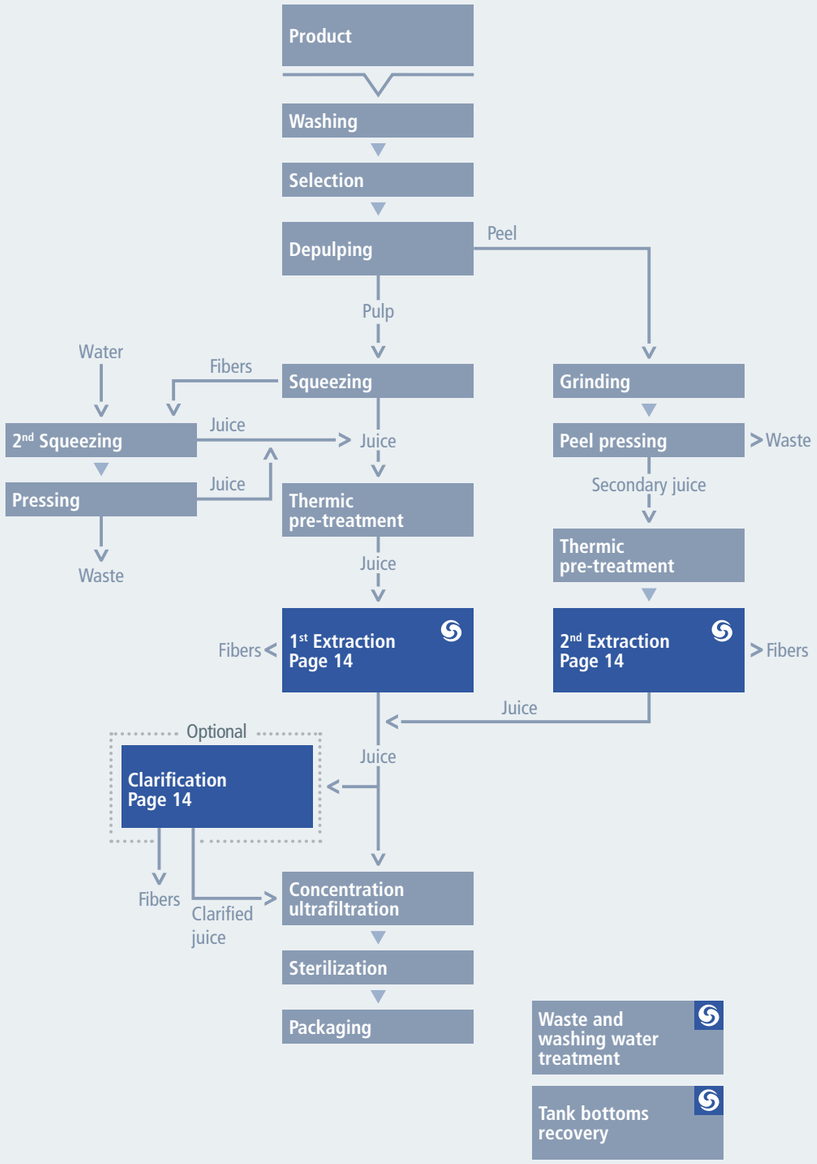


Process section involving Pieralisi technologies

Example of process flow diagram

PIERALISI CIRCULAR THINKING

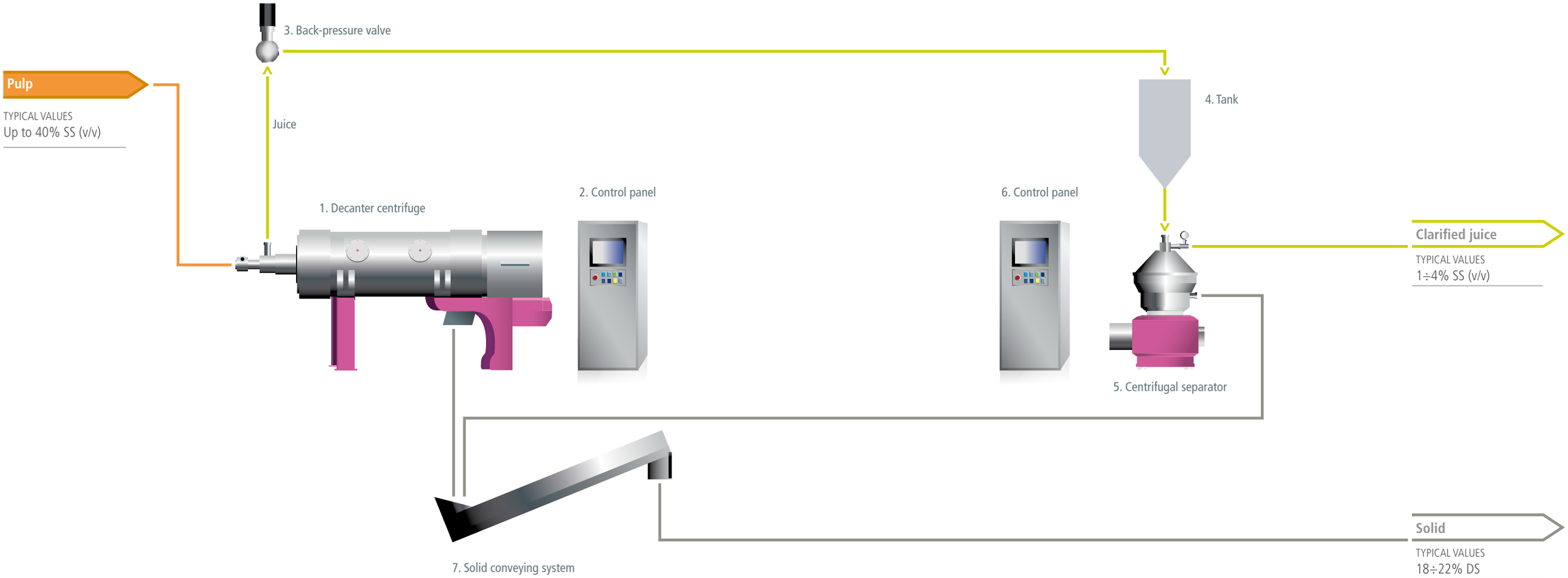
9 Pineapple juice



Process section involving Pieralisi technologies

Example of process flow diagram

Juice extraction and clarification



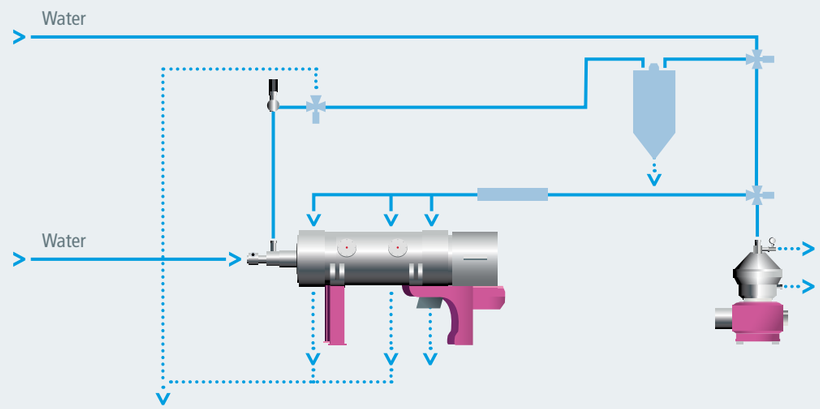
A complete line for extraction and clarification of fruit and vegetable juice consists of the following components:

1 . Decanter centrifuge
2 . Control panel for decanter centrifuge
3 . Back-pressure valve
4 . Tank
5 . Centrifugal separator
6 . Control panel for centrifugal separator
7 . Solid conveying system

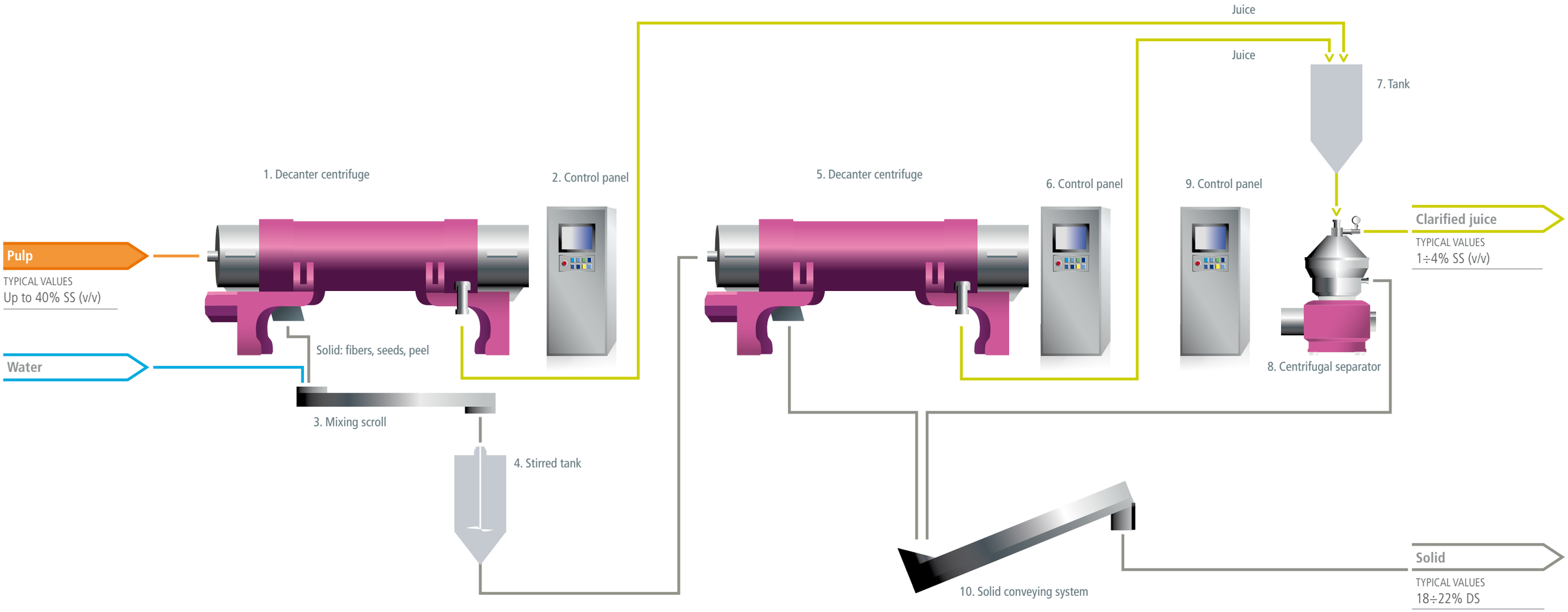
CIP washing system

Washing circuit

Flushing circuit



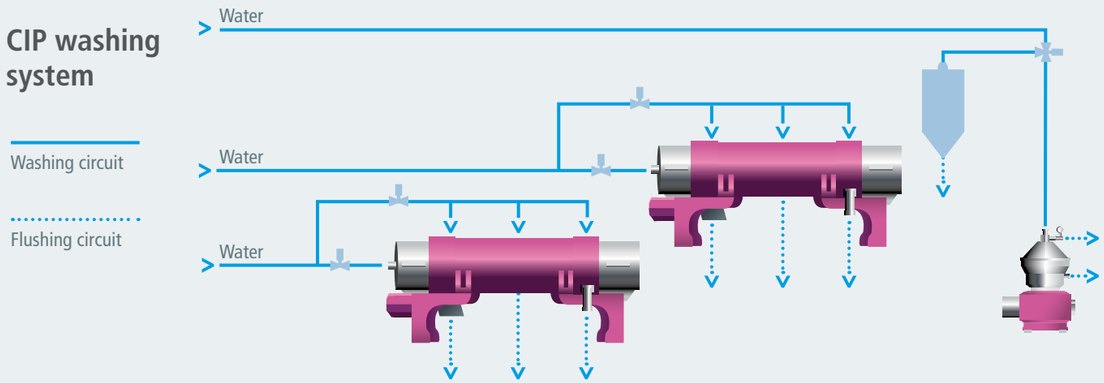
Double juice extraction and clarification



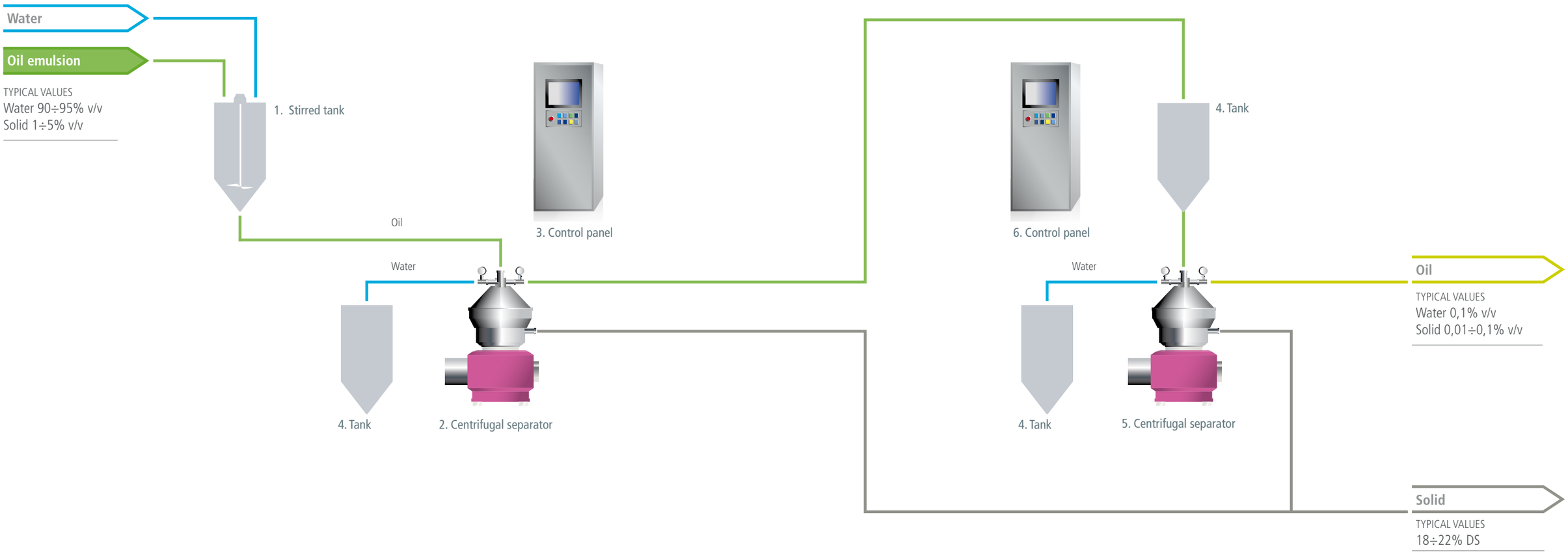
A complete line for extraction and clarification of fruit and vegetable juice consists of the following components:

1 . Decanter centrifuge
2 . Control panel for decanter centrifuge
3 . Mixing scroll
4 . Stirred tank
5 . Decanter centrifuge
6 . Control panel for decanter centrifuge
7 . Tank
8 . Centrifugal separator
9 . Control panel for centrifugal separator
10 . Solid conveying system

CIP washing system



Essential oils concentration and purification



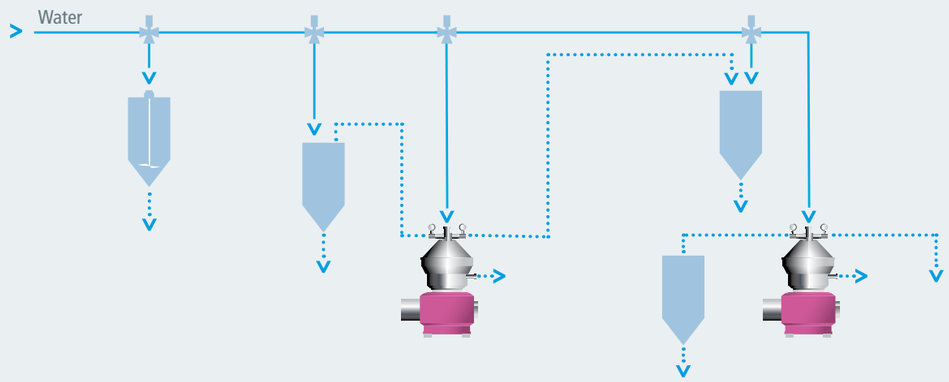
A complete line for concentration and purification of essential oils consists of the following components:

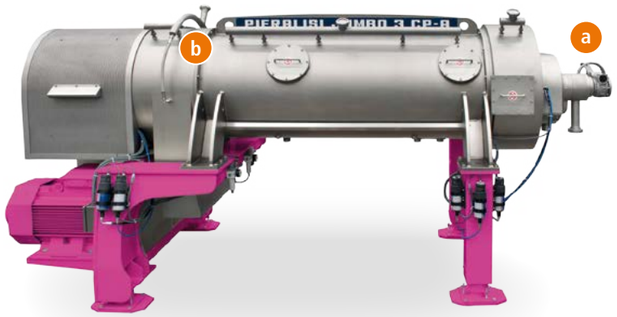
1 . Stirred tank
2 . Centrifugal separator
3 . Control panel for centrifugal separator
4 . Tanks
5 . Centrifugal separator
6 . Control panel for centrifugal separator

CIP washing system

Washing circuit

Flushing circuit



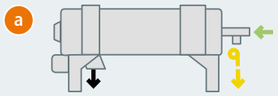


Decanter centrifuge

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. The centripetal pump (a) and the solid scraper (b) are the most common systems used in food applications.

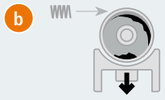
Adjustable Centripetal Pump (CPA)

In order to satisfy the specific needs of some applications and provide better performances and greater operating flexibility, Pieralisi has developed a special device called Adjustable Centripetal Pump (CPA), that allows to discharge the clarified liquid from the bowl. The use of the centripetal pump, integrated in the decanter liquid side terminal, permits to have the clarified liquid outlet under pressure, minimizing the contact with the air and the consequent oxidation phenomena or foam formation. Another specific advantage of the centripetal pump is to allow the continuous regulation of liquid exit level during operation; this option bestows to the decanter a great versatility, which results essential for an optimal management of the performances mainly in presence of products with variable concentrations and characteristics. The centripetal pump uniqueness and peculiarities make Pieralisi's CPA decanters particularly fit for the food industry, above all in the beverage sector. Pieralisi's CPA centrifuges are available in both 2 or 3 phases version.



Solid scraper device

The dehydrated solid that is stockpiled on the bowl internal walls, is transported by a scroll and continuously emptied towards the side opposite 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.



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 of the juice 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 the centripetal pump. The discharge by means of the centripetal pump permits, as for decanters, to have a pressurized outgoing flow to avoid the air contact and the consequent possible oxidation and to minimize the foam formation.

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:

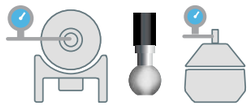
- separation process monitoring
- operating parameters control
- alarms detection and interlocks
- main parameters trend display

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.

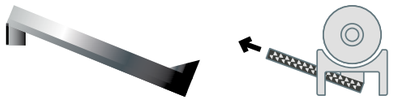
Upon request, only the control unit (TCP) can be supplied: this solution does not consider the possibility to control the auxiliaries and does not have the electrical section with VFD and breakers.

Back pressure valve



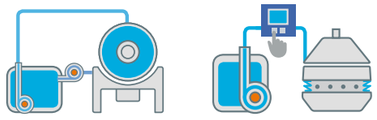
In presence of liquid discharged by means of the centripetal pump, it is possible to control the clarified liquid pressure through a dedicated control valve (manual or automatic). The aforementioned regulation, besides sending the product to a certain distance from the discharge point without using any external pump, it significantly contributes to a more precise control of the clarified liquid quality that is obtained from the separation process.

Solid conveying system



The solid exiting from the decanter can be discharged by gravity in an underlying container or it can be moved in a lateral one, using an adequate horizontal or inclined scroll conveying system. The main control panel can handle every single component of the system, it automatically activates the start and stop sequences, in relation to the centrifuge effective working conditions. The Pieralisi's decanter unique design allows installing the conveyor directly under the solid exit without any further civil work.

CIP washing system



In the food industry, the requirements of hygiene and cleanliness of the pieces of equipment are very restrictive and therefore they are absolutely unavoidable. Pieralisi centrifuges (both decanters and separators) are provided with a reliable and efficient CIP washing system (Clean in Place), that is automatically run from the control panel and can be set depending on every single process need. Two specific washing sequences are automatically started and handled by the control panel at the end of each operation cycle or in case of necessity. A number of dedicated solenoid valves, conveniently installed in the washing circuit, allows to feed the washing liquid in various points, both inside the rotating assembly and in its external part, between bowl and case. The CIP washing procedure, besides being a fundamental requirement to fulfill the food industry regulation, it represents a primary element in order to preserve the functionality of each single component of the separation unit and to maintain the highest level of reliability and performance in the course of time.

Configuration table

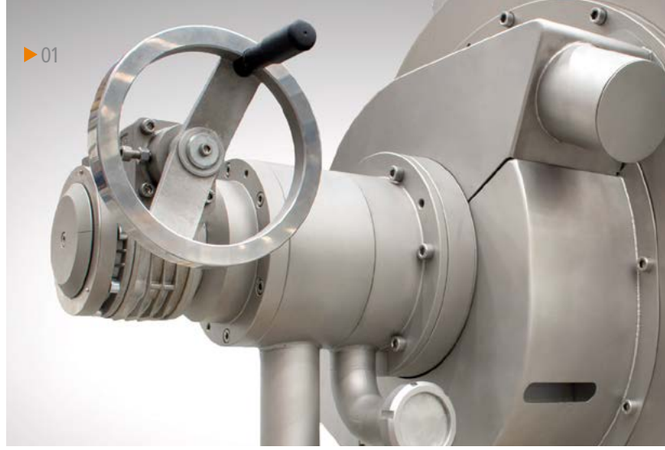
PIERALISI CIRCULAR THINKING

Decanter centrifuge

			1 Citrus fruit juice	2 Essential citrus fruit oils	3 Apple and pear juice	4 Peach, apricot, prune, kiwi juice	5 Berry juice	6 Mango, guava, papaya, lychee juice	7 Tomato and carrot juice	8 Grape juice	9 Pineapple juice
ROTATING ASSEMBLY	**Bowl**	Shallow cone									
		Inner surface with liners									
		Inner surface with grooves									
		Wear protection solid discharge bushings (replaceable)									
	Scroll	Single flight									
		Variable pitch flight									
		Flight with windows									
		Flight wear protections: sprayed tungsten carbide									
MATERIALS	**Bowl and scroll**	SAF 2205 Duplex									
		AISI 316 Stainless steel									
	Case	Stainless steel cylindrical body									
		Stainless steel solid-liquid chambers									
		Stainless and painted carbon steel cylindrical body, internal coating in stainless steel									
		Stainless steel subframe									
		Painted carbon steel subframe									
	Parts in contact with the product	Stainless steel									
		Tailored on the application and international standards									
EXECUTION	**Installation area**	Safe area									
LUBRICATION	**Gearbox**	Oil bath (tailored on the FDA specifications)									
	Bearings	Automatic greasing (grease tailored on the FDA specifications) ▶ 03									
PROCESS CONFIGURATION	**Liquid outlet**	Interchangeable liquid outlet levels									
		Liquid discharge level adjustable during operation (CPA) ▶ 01									
DRIVES	**Bowl drive**	Electric motor									
	Scroll drive	Fixed differential speed									
		Electric motor (back drive)									
		Hydraulic motor									
		Rotovariator									
DECANTER OPTIONS	**Kits and systems**	Control panel									
		Counter pressure valve									
		Cooling fan									
		Solids scraper device									
		Cip washing system ▶ 02									
PLANT OPTIONS	**Kits and systems**	Filtering unit									
		Solid conveying system									
		Feeding pump									
		Flow rate measurement kit									
		Heating system									

Centrifugal separator

PROCESS CONFIGURATION	**Liquid discharge**	Single outlet under pressure
		Double outlet under pressure
	Solid discharge	Manual
		Automatic
	Type of separation discs	Clarifier
		Concentrator
MATERIALS	**Bowl**	SAF 2205 Duplex
	Cover	Stainless steel
	Frame	Cast iron with stainless steel inner protection
		Stainless steel ▶ 04
	Wet parts	Stainless steel
		Tailored on the application and international standards
PROTECTION	**Gaskets**	High wear and corrosion resistant
	Seal	With wear and corrosion special protection system
TRANSMISSION	**Type**	Gears
		Belts
	Lubrication	Oil bath (tailored on the FDA specifications)
		Oil with forced circulation cooling system
EXECUTION	**Installation area**	Safe area
INSTALLATION	**Type**	Stand alone separator with vibration absorber and anchor device
		Separator on stainless steel base
		Stainless steel skid equipped with control panel and auxiliary units
SEPARATOR OPTIONS	**Kits and Systems**	Control panel
		Manual activation of the solid discharge
		Automatic activation of the solid discharge
		Cip washing system
PLANT OPTIONS	**Kits and Systems**	Filtering unit
		Constant level feeding system
		Feeding pump
		Flow rate measurement kit


▶ 01

▶ 02

▶ 03

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