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 Group, 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

- Product
- Washing
- Selection
- Squeezing
- Filtration
- Extraction
- Pasteurization
- Concentration
- Packaging

2. Essential citrus fruit oils

- Peel and fibers
- Homogenization
- Concentration
- Purification
- Waste and washing water treatment
- Tank bottoms recovery

Example of process flow diagram.
3 Apple and pear juice

Example of process flow diagram

Process section involving Pieralisi technologies

Product
Washing
Selection
Grinding
Pre-heating and enzymatic treatment

1st Extraction
Page 14

Fibers, peel
Homogenization
Water

2nd extraction juice

Juice

Fibers

Optional
Clarification
Page 14

Juice

Fibers

Clariﬁed juice

Pasteurization

Concentration and ﬁnal treatment

Packaging

Waste and washing water treatment

Tank bottoms recovery

4 Peach, apricot, prune, kiwi juice

Example of process flow diagram

Process section involving Pieralisi technologies

Product
Washing
Selection
Depulping
Grinding
Pre-heating and enzymatic treatment

Purée

Fibers

Waste and washing water treatment

Tank bottoms recovery

Extraction
Page 12

Juice

Fibers

Pasteurization

Packaging

Fibers
5 Berry juice

Product
- Washing
- Selection
- Grinding
- Pre-heating and enzymatic treatment

Extraction Page 12

Juice

Clarification Page 14

Juice

Fibers, seeds

Clarified juice

Optional

Concentration

Pasteurization

Packaging

6 Mango, guava, papaya, lychee juice

Product
- Washing
- Selection
- Depulping
- Squeezing
- Pre-heating and enzymatic treatment

Extraction Page 12

Juice

Clarified juice

Optional

Pasteurization

Packaging

Waste and washing water treatment

Tank bottoms recovery
**Tomato and carrot juice**

1. **Product**
2. **Washing**
3. **Peeling (only for carrots)**
4. **Selection**
5. **1st stage pulping**
6. **2nd stage pulping (only for tomatoes)**
7. **Pre-heating and enzymatic treatment**
8. **Extraction**
   - Page 12
9. **Juice**
10. **Concentration**
11. **Sterilization**
12. **Packaging**
13. **Homogenization**
14. **Clariication**
   - Page 12
15. **Pasteurization**
16. **Packaging**
17. **Fibers**
18. **Waste and washing water treatment**
19. **Tank bottoms recovery**

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**Grape juice**

1. **Product**
2. **Destemmer**
3. **Pre-heating and enzymatic treatment**
4. **Extraction**
   - Page 14
5. **Juice**
6. **Pasteurization**
7. **Packaging**
8. **Fibers**
9. **Waste and washing water treatment**
10. **Tank bottoms recovery**
9 Pineapple juice

Process section involving Pieralisi technologies

Example of process flow diagram:

- Product
- Washing
- Selection
- Depulping
- Peel
- Grinding
- Squeezing
- Pressing
- Thermic pre-treatment
- Concentration
- Sterilization
- Clarification
- Waste and washing water treatment
- Packaging
- Tank bottoms recovery

Process for Pineapple juice:

1. **Washing**
2. **Selection**
3. **Depulping**
   - **Fibers**
   - **Pulp**
4. **Grinding**
5. **Squeezing**
   - **Fibers**
   - **Juice**
6. **Pressing**
   - **Waste**
7. **Thermic pre-treatment**
   - **Juice**
8. **Concentration**
9. **Sterilization**
10. **Clarification**
11. **Waste and washing water treatment**
12. **Packaging**
13. **Tank bottoms recovery**

Optional steps:

- **2nd Squeezing**
- **2nd Depulping**
- **2nd Grinding**
- **2nd Squeezing**
- **2nd Depulping**
- **2nd Grinding**
- **Optional**

Product flow:

- **Juice**
- **Clarified juice**
- **Waste**
- **Waste and washing water treatment**

Tank bottoms recovery:

- **Waste and washing water treatment**
- **Tank bottoms recovery**

Illustrations:

- Example of process flow diagram
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

Typical values:

- Up to 40% SS (v/v)
- 18÷22% DS
- 1÷4% SS (v/v)
- 1÷4% SS (v/v)
- 18÷22% DS

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

TYPICAL VALUES

- Pulp: Up to 40% SS (v/v)
- Solid: fibers, seeds, peel
- Juices: 1% SS (v/v), 18÷22% DS
- Clarified juice: 1÷4% SS (v/v), 1-4% SS (v/v)

CIP washing system

Washing circuit

Flushig circuit
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
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 to the rotational speed and to the bowl diameter. The product to be clarified (density, viscosity, quantity and dimension of solid particles) is a key factor in determining the performance of the decanter centrifuge. 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 pneumatic 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.

Adjustable Centripetal Pump (CPA)

In order to satisfy the specific needs of some applications and provide better performances and greater operating flexibility, Pieralisi Group 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.

Fruit and vegetable juice: Components

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 combination 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 HMIs 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 HMIs 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 supports.

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’s 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.
Decanter centrifuge

| 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 protection: 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 |
| Parts in contact with the product | Painted carbon steel subframe |

| EXECUTION | Installation area | Safe area |
| LUBRICATION | Gearbox | Oil bath (tailored on the FDA specifications) |
| | Bearings | Automatic greasing (grease tailored on the FDA specifications) |

| PROCESS CONFIGURATION | Liquid outlet | Liquid discharge level adjustable during operation |
| | Bowl drive | Electric motor |
| | Scroll drive | Fixed differential speed |
| | | Electric motor (back drive) |
| | | Hydraulic motor |
| | | Rotovariovar |

| DECANTER OPTIONS | Kits and systems | Cooling fan |
| | | Solids scraper device |
| | | Cip washing system |

| PLANT OPTIONS | Kits and systems | Filtering unit |
| | | Solid conveying system |
| | | Flow rate measurement kit |
| | | Heating system |

Centrifugal separator

| PROCESS CONFIGURATION | Liquid discharge | Single outlet under pressure |
| | Double outlet under pressure |
| Solid discharge | Manual |
| | Automatic |

| MATERIALS | Bowl | SAF 2205 Duplex |
| Cover | Stainless steel |
| Frame | Cast iron with stainless steel inner protection |
| | Stainless steel |
| Wet parts | Stainless steel |

| PROTECTION | Gaskets | Tailored on the application and international standard |
| Seal | With wear and corrosion resistant |

| TRANSMISSION | Type | Belts |
| | 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 | Manual activation of the solid discharge |
| | Cip washing system |

| PLANT OPTIONS | Kits and Systems | Constant level feeding system |
| | Feeding pump |
| | Flow rate measurement kit |