Fruit and vegetable juice

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 (Peel, Juice, pulp)
- Filtration (Fibers, Cloudy juice)
- Extraction Page 12 (Fibers)
- Clarification Page 12 (Juice)
- Pasteurization
- Concentration
- Packaging

2. Essential citrus fruit oils

- Peel and fibers
- Homogenization
- Concentration Page 16
- Purification Page 16
- Waste and washing water treatment
- Tank bottoms recovery
3 Apple and pear juice

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

Waste and washing water treatment
Tank bottoms recovery

1st Extraction Page 14

Juice

Purée

Clarification Page 14

Optional

Juice

2nd Extraction Page 14

Pre-heating and enzymatic treatment

Homogenization

Waste and washing water treatment

Tank bottoms recovery

Optional

Purée

Fibers

Juice

Fibers

Optional

Optional

Extraction Page 12

4 Peach, apricot, prune, kiwi juice

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

Waste and washing water treatment
Tank bottoms recovery

Juice

Purée

Fibers
5 Berry juice

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

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<tr>
<th>Purée</th>
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<th>Juice</th>
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Optional

Clarification Page 14

- Fibers
- Clarified juice
- Concentration
- Pasteurization
- Packaging

6 Mango, guava, papaya, lychee juice

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

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<tr>
<th>Purée</th>
<th>Fibers, seeds</th>
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Optional

Clarification Page 14

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Waste and washing water treatment

Tank bottoms recovery

Example of process flow diagram
7 Tomato and carrot juice

Product

Washing

Peeling (only for carrots)

Selection

1st stage pulping 2nd stage pulping (only for tomatoes)

Pre-heating and enzymatic treatment

Purée

Juice

Extraction Page 12

Homogenization

Pasteurization

Packaging

2nd extraction juice

Concentration

Sterilization

Packaging

Optional

Waste and washing water treatment

Tank bottoms recovery

8 Grape juice

Product

Destemmer

Pre-heating and enzymatic treatment

Purée

Water

1st Extraction Page 14

Fibers, peel

Homogenization

2nd extraction juice

2nd Extraction Page 14

Fibers

Optional

Juice

Clarification Page 14

Fibers

Clarified juice

Pasteurization

Packaging

Waste and washing water treatment

Tank bottoms recovery
9 Pineapple juice

Process section involving Pieralisi technologies

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

- **Pulp**
  - Up to 40% SS (v/v)

- **Juice**
  - Up to 40% SS (v/v)

- **Solid**
  - 18÷22% DS

- **Clarified juice**
  - 1÷4% SS (v/v)

### CIP washing system

- **Washing circuit**
- **Flushing circuit**
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**

- **Solid**
  - Typical values: 18÷22% DS

- **Clarified juice**
  - Typical values: 1÷4% SS (v/v)

- **Juice**
  - Up to 40% SS (v/v)

**CIP washing system**

- **Washing circuit**
- **Flushing circuit**
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

**TYPICAL VALUES**

- **Water**
  - 90÷95% v/v
  - 1÷5% v/v

- **Solid**
  - 18÷22% DS

- **Oil**
  - 0,1% v/v
  - 0,01÷0,1% v/v

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.

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.

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.

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.

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 in an automatic and intermittent way. The clarified liquid centrally climbs back towards the top of the bowl and it continues exits through the centripetal pump. The discharge by means of the centripetal pump permits, for as 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 in 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.

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 step. 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

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### Centrifugal separator

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