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MINERAL FUELS & LUBRICANTS

Mineral Fuels and Lubricants

Mineral fuels and lubricants derived from crude oil are a commodity strongly related to many businesses operating costs and environmental impacts. This is the reason why many companies are exploring new technologies to extend the use of oils, reduce maintenance and increase the recovery rate.

- 1. Refinery/Industrial Oily Waste
- 2. Exhaust/Used Oil
- 3. Tank Cleaning
- 5. Lube Oil Treatment



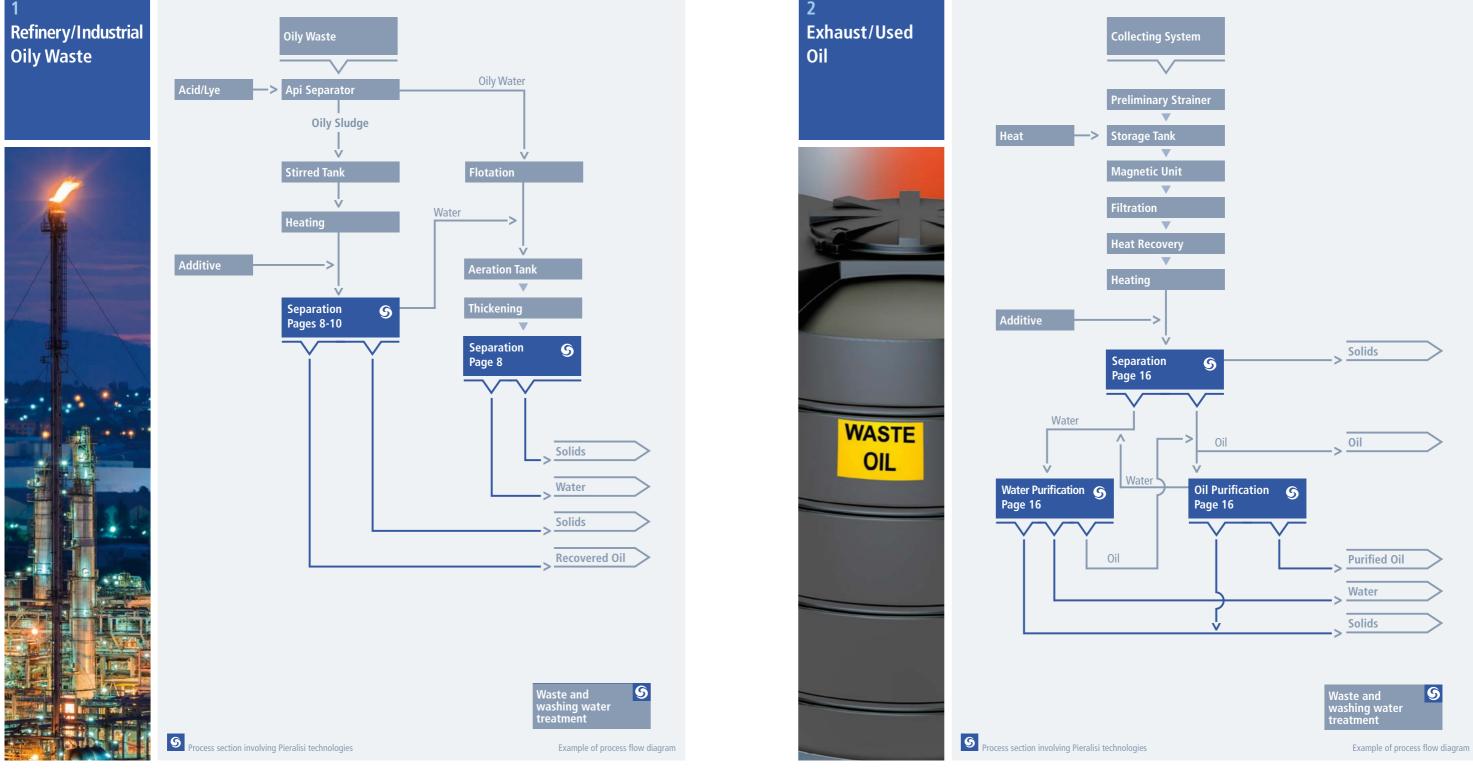
Pieralisi offers technological solutions for fuels cleaning and treatment, for lube oils purification, for the conditioning and recovery of mineral oils, industrial or environmental slop oils, bottom tank residues and bilge water. Furthermore, our easy and efficient solutions are aimed to reduce the operating costs and protect the environment.

4 . Lagoon and Sedimentation Pond Treatment 6 . Liquid Fuel Purification and Conditioning

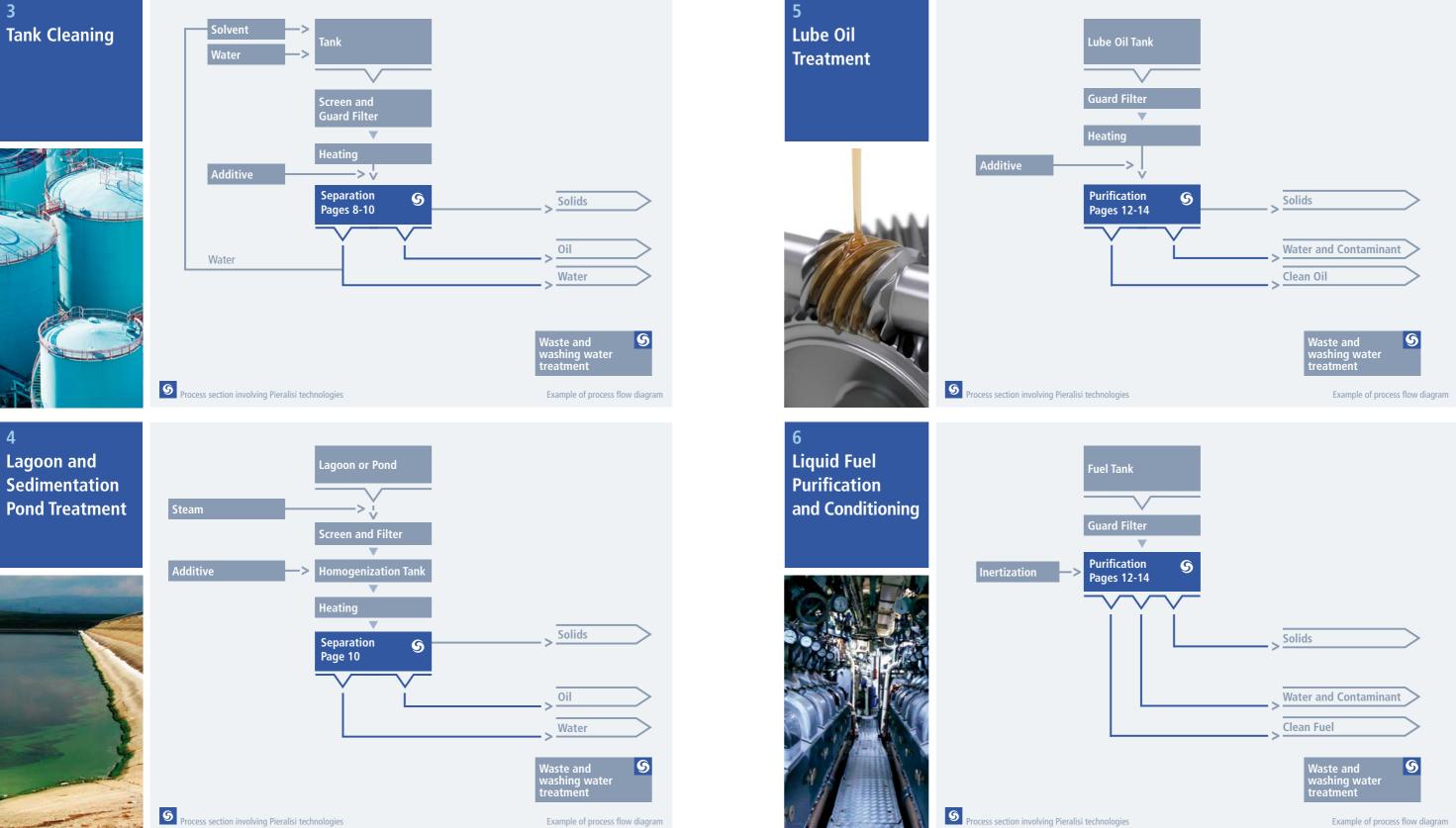












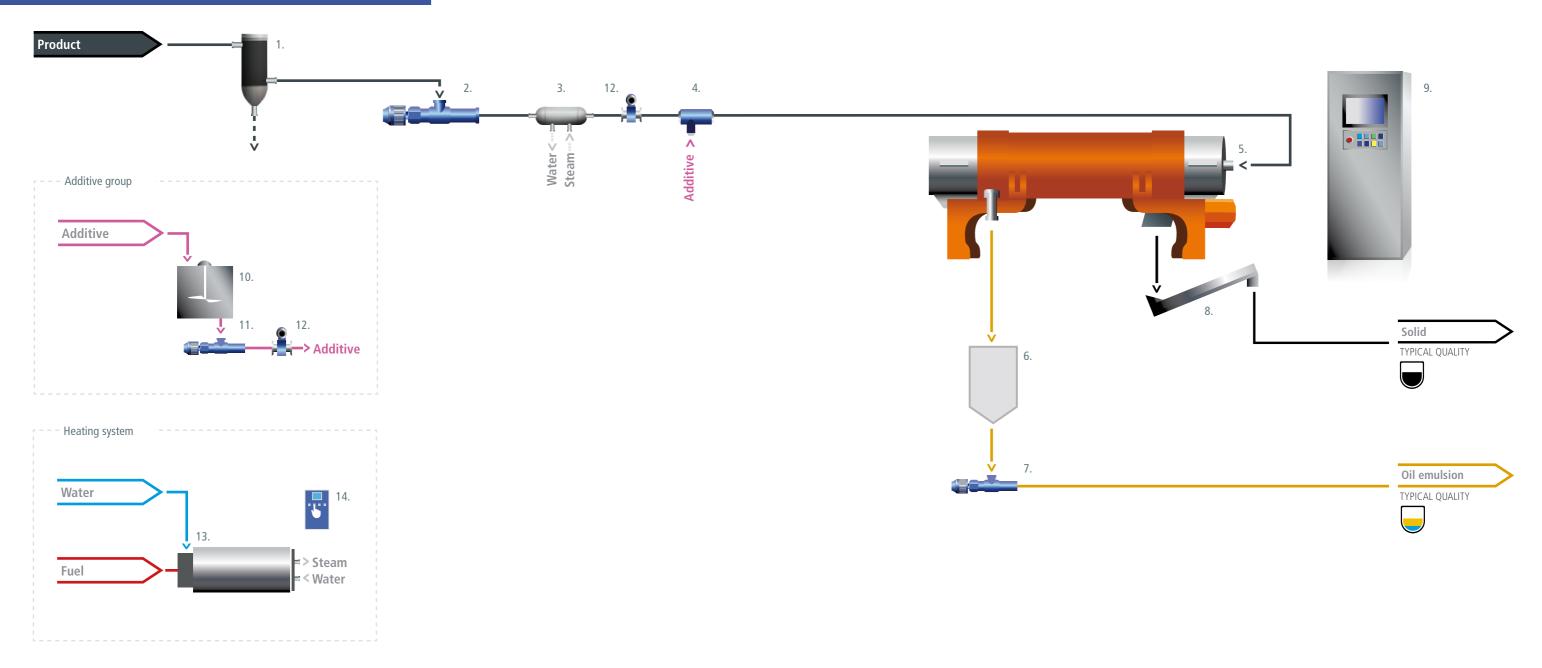


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Example of process flow diagram



Single Step 2 Phase



This configuration includes the following pieces of equipment:

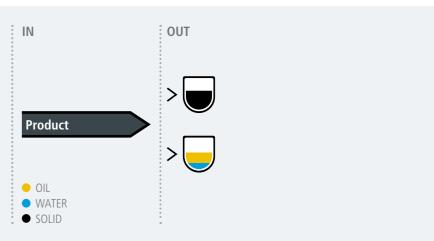
- 1. Filter
- 2. Product pump
- 3. Heat exchanger
- 4. Static mixer
- 5. Decanter centrifuge
- 6. Oil emulsion tank
- 7. Oil emulsion pump

- 8. Screw conveyor
- 9. Main control panel
- 10. Mixing tank
- 11. Additive solution pump
- 12. Flow meter
- 13. Steam generator
- 14. Heating system control panel

The simplest treatment unit is based on a single 2 phase decanter and the target is to remove the sediments from the liquid phase without separating the water from the oil. The separated solid phase has to be disposed of.

MAIN BENEFITS

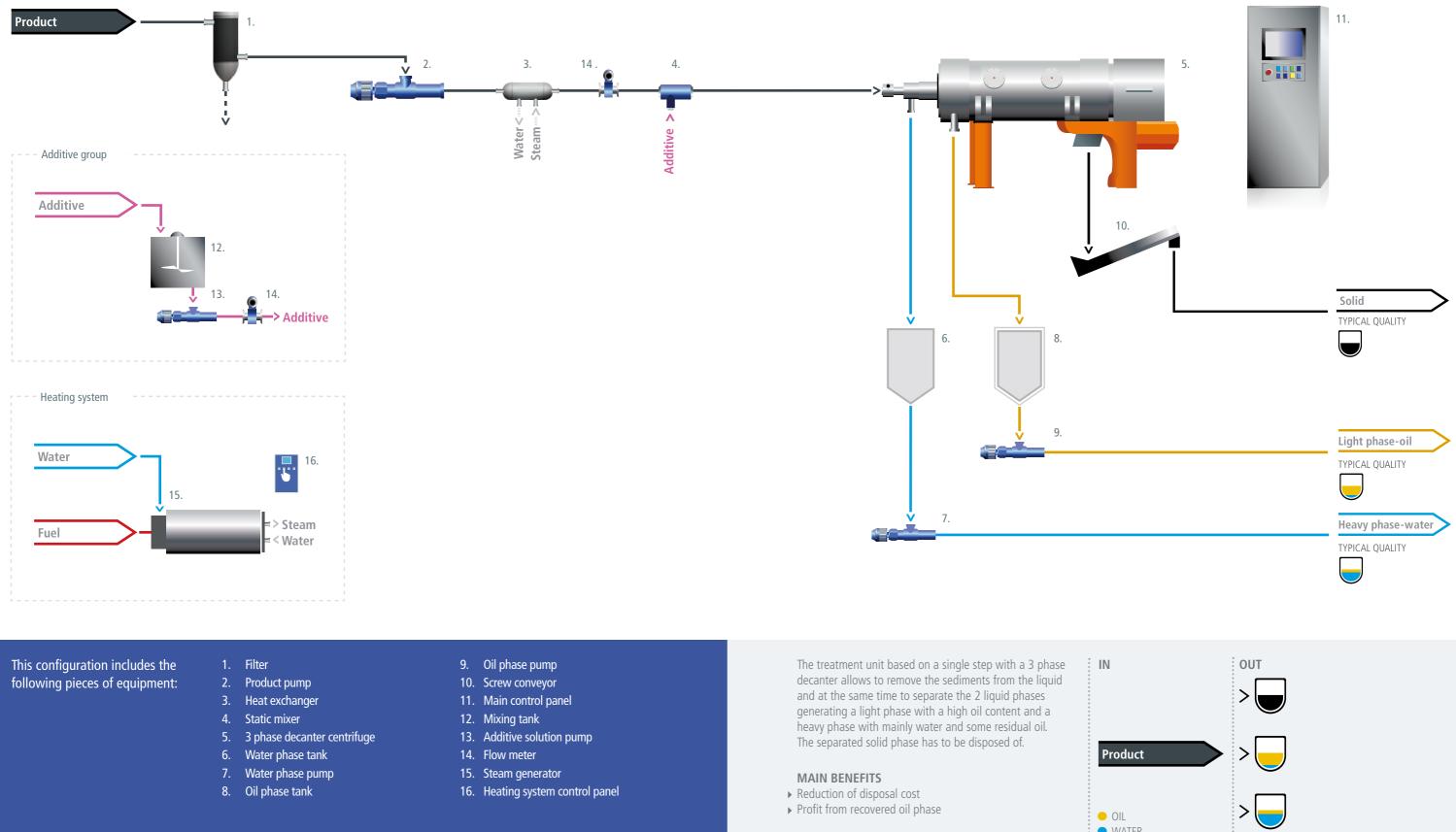
- ▶ Reduction of disposal cost
- ▶ Profit from recovered oil phase



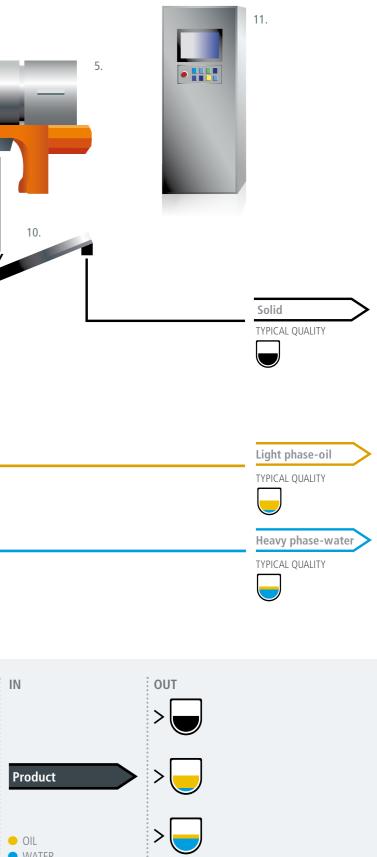


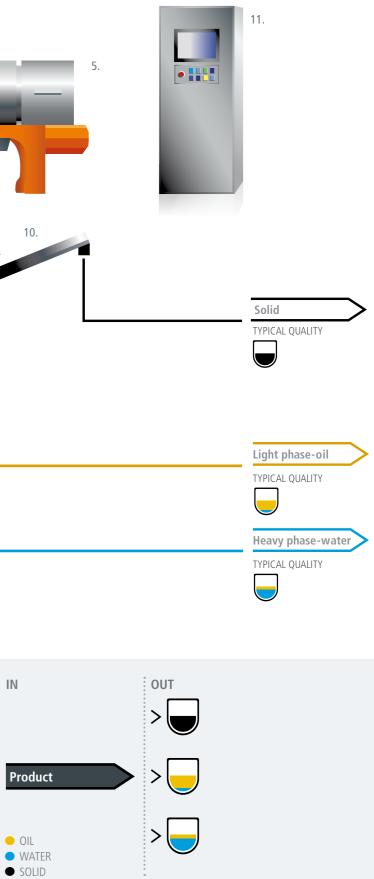
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Single Step 3 Phase





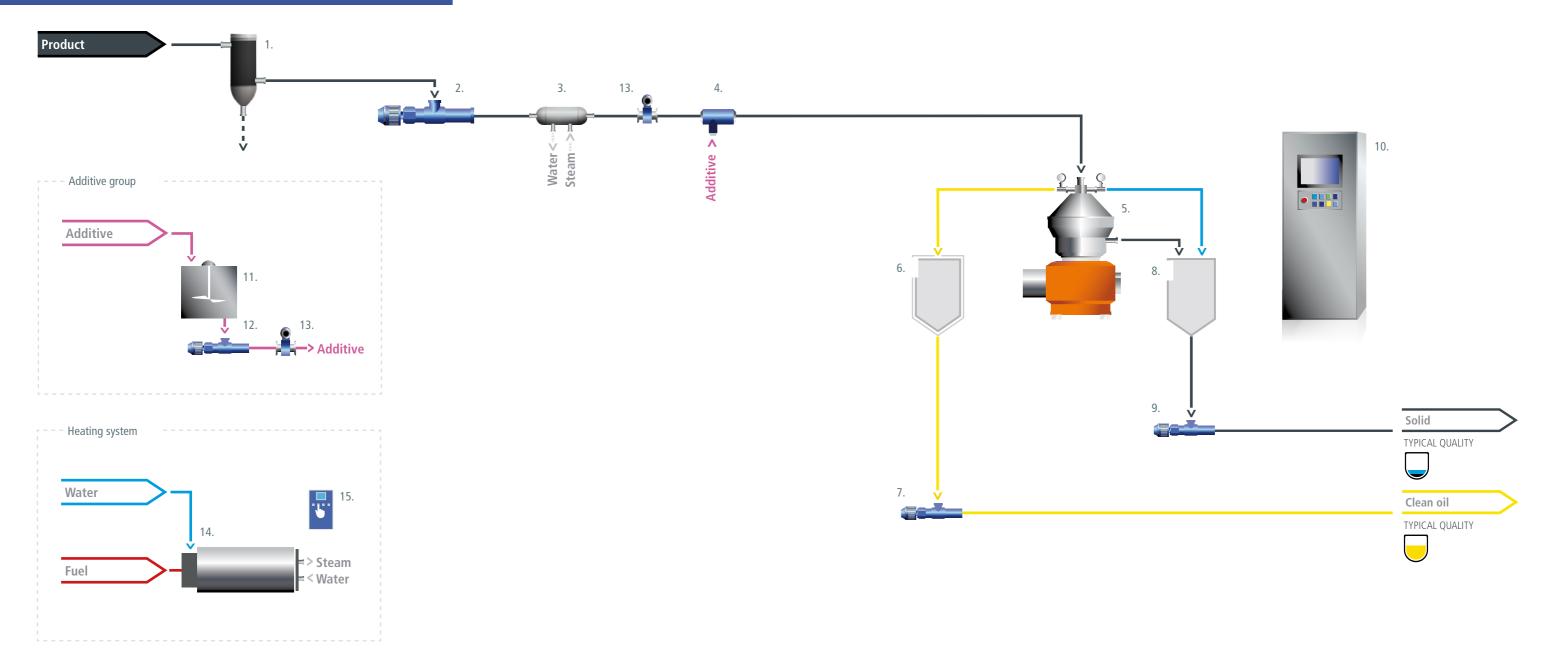






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Single Step 3 Phase - low solid content



This configuration includes the following pieces of equipment:

- 1. Filter
- 2. Product pump
- 3. Heat exchanger
- 4. Static mixer
- 5. Centrifugal separator
- 6. Clean oil tank
- 7. Clean oil pump
- 8. Solid discharge tank

- 9. Solid pump
- 10. Main control panel
- 11. Mixing tank
- 12. Additive solution pump
- 13. Flow meter
- 14. Steam generator
- 15. Heating system control panel

The treatment unit based on a single step with a 3 phase vertical separator is recommended when the solid content in the inlet product is relatively low. The final result is to clarify the main product (usually oil of fuel) by removing all the solid and liquid contaminants (i.e. sediments and water). The separated solid / liquid phase has to be disposed of.

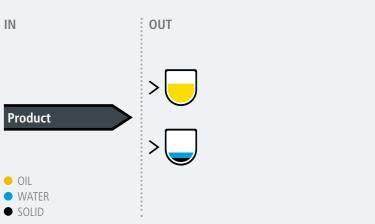
oil

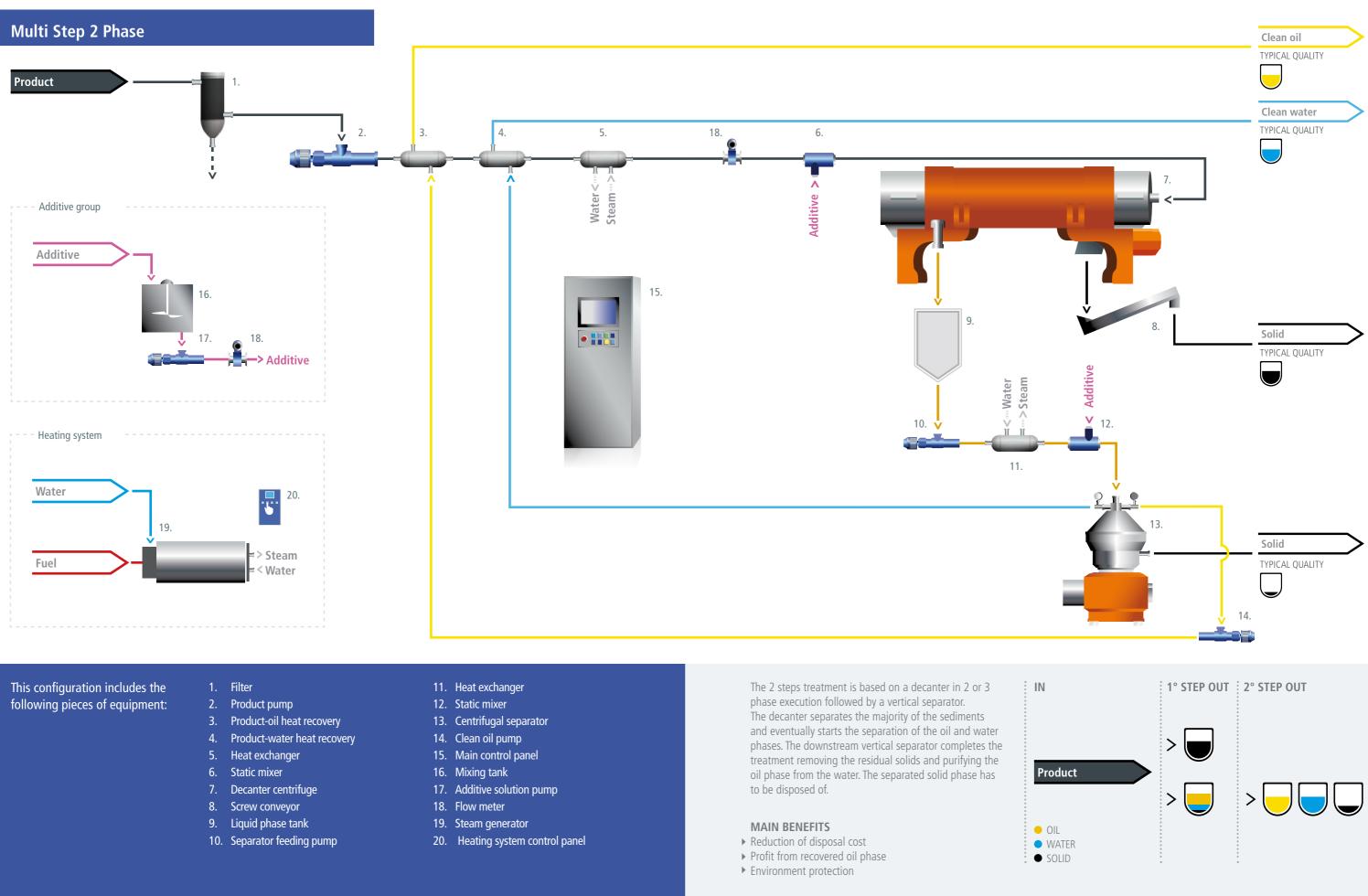
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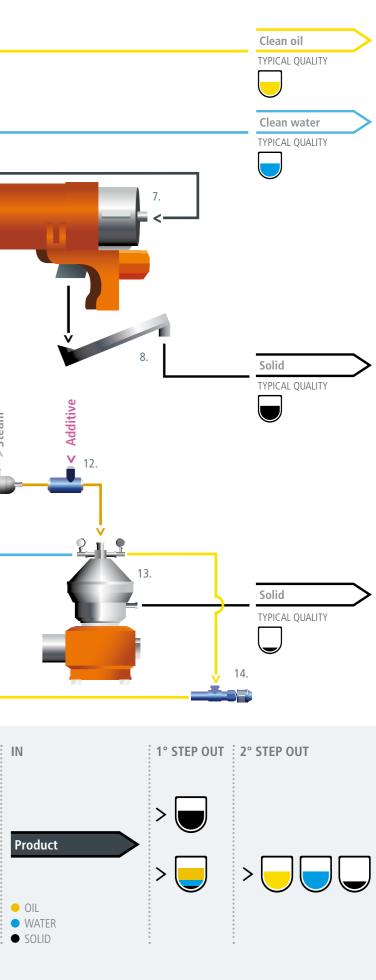
MAIN BENEFITS

- ► Increase in machinery's life time
- ► Reduction of operating cost
- Reliability improvement
- Environment protection

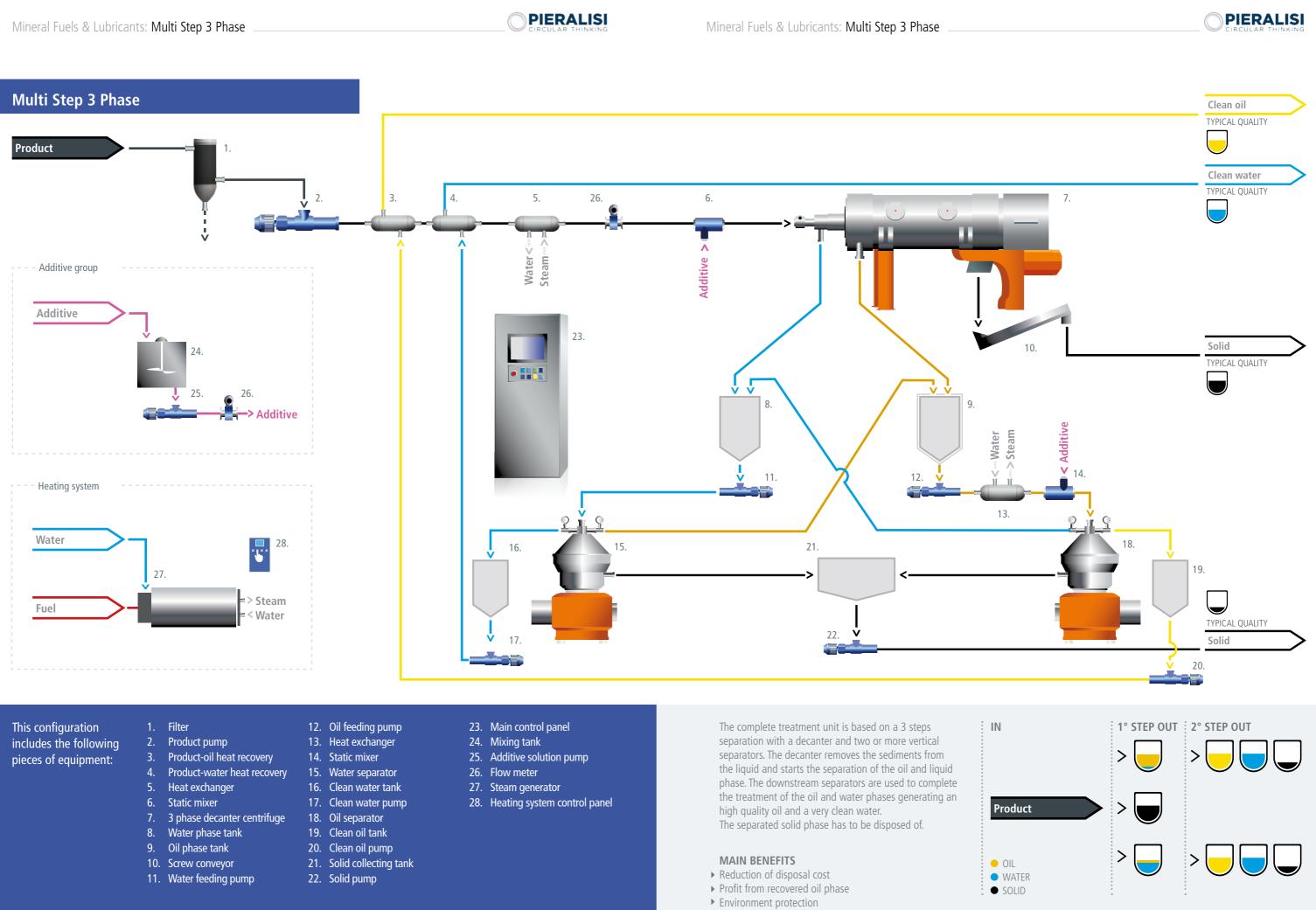












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Decanter centrifuge

Pieralisi decanter centrifuges are based on a modern technology that combines formation. Another specific advantage of the centripetal pump is to allow the ability of treating high solids content products with an excellent clarification the continuous regulation of liquid exit level during operation; this option efficiency. Separation performances are related not only to mechanical details bestows to the decanter a great versatility, which results essential for an but also to operating parameters (centrifugal force, flow rate, differential optimal management of the performances mainly in presence of products speed, liquid levels) and to the specific characteristics of the product (density, viscosity, quantity and dimension of solid particles).

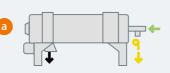
A main motor connected to the decanter shaft drives the bowl rotation. The extremely high centrifugal force generated inside the bowl is proportional to the rotational speed and to the bowl diameter. The product to be clarified enters through the feeding pipe, it passes in the diffuser to be distributed 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 some of the most common systems used in mineral fuels & lubricants 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

with variable concentrations and characteristics. The centripetal pump uniqueness and peculiarities make Pieralisi's CPA decanters particularly fit

for the petrochemical industry, above all in the slop oil 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

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 guality 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.

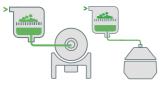
The combined action of the centrifugal force together with the presence scroll differential speed. of the internal discs leads to the separation of the solid particles that are The PLC automatically handles and controls the **centrifugal separator** deposited on the bowl wall, where these are discharged in an automatic in each operating step (start-up, duty, discharge, flushing and shutdown), and intermittent way. The clarified liquid centrally climbs back towards the monitors the main parameters and effectively manages any anomaly or top of the bowl and it continuously exits through the centripetal pump. emergency. The discharge by means of the centripetal pump permits, as for decanters, All Pieralisi control panels can be equipped with a dedicated module suitable to have a pressurized outgoing flow. for remote connection, supervision, diagnostics and support.

Homogenizing system



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

Filtering unit



Ensures the large solids removal from inlet product, protecting downstream pieces of equipment.

Heating system



Regulates the temperature of inlet product.

Additive unit



Allows the preparation and dosing of the additive necessary for the process.

Inertization system



Protects the decanter and separator through an inert gas barrier, avoiding potential explosive mixtures inside (ATEX).







Electrical and control panel

Pieralisi vertical centrifuges represent the perfect technological solution to "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

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.



Counter pressure valve





Controls the pressure of the liquid phase outlet and the separation interphase.





Refinery/Industrial Oily Waste	Exhaust/Used Oil	Tank Cleaning	Lagoon/sedimentation Pond Treatment	Lube Oil Treatment	Liquid Fuel Purification and Conditioning
1	2	3	4	5	6

Decanter Centrifuge

			2	J	-	J	
	Bowl	Shallow cone					
		Inner surface with liners					
		Inner surface with grooves					
		Wear protections solid discharge bushings (replaceable)					
ROTATING ASSEMBLY		Wear protections inner layer (flame spray)					
	Scroll	Single flight (S), Reduced pitch (R), Variable pitch (V), Double flight (D)					
		Flight with windows					
		Flight wear protections: sprayed tungsten carbide (S) or with STC tiles (T)					
		Diffuser replaceable wear protection: AISI 440 or STC					
	Bowl and scroll	AISI 414 stainless steel / AISI 304 stainless steel					
		SAF 2205 Duplex stainless steel / AISI 316 stainless steel					
		Cylindrical body: Painted carbon steel (PCS), Stainless steel (SS)					
MATERIALS	Case	Stainless steel solid-liquid chambers					
		Subframe: Painted carbon steel (PCS), Stainless steel (SS)					
	Parts in contact with the product	Tailored on the application and international standards					
		Safe area					
EXECUTION	Installation area	Hazardous area: ATEX Zone 1 (Class 1 Div 1)					
		Hazardous area: ATEX Zone 2 (Class 1 Div 2)					
	Gearbox	Oil bath (tailored on the FDA specifications)					
LUBRICATION	Bearings	Automatic greasing (grease tailored on the FDA specifications) > 03					
	Liquid process handling	Two phase (2P), Three phase (3P)					
PROCESS		Interchangable liquid outlet levels					
CONFIGURATION		Liquid discharge level continuous adjustable during operation (CPA) > 02					
	Bowl drive	Electric motor (EM), Hydraulic drive (FH)					
DRIVES	Scroll drive	Fixed pulleys					
		Electric motor (BD), Rotovariator (RTV), Hydraulic motor (SH)					
	IS Kits and systems	Electric control panel					
		Counter pressure valve					
		Inertization system					
		Solids scraper device $ ightarrow 01$					
Centrifugal Sena	rator						

Centrifugal Separator

	Liquid discharge	Single outlet under pressure (TL, TH), double outlet under pressure (2T)			
PROCESS CONFIGURATION	Solid discharge	Manual (S) or Automatic (FPC)			
CONTROLLATION	Type of separation discs	Clarifier (CL), Purifier (P), Separator (S), Concentrator (C)			
	Bowl	SAF 2205 Duplex			
MATERIALS	Cover	Stainless steel			
IVIATERIALS	Frame	Cast iron with stainless steel inner protection (CI) or Stainless steel (SS)			
	Wet parts	Tailored on the application and international standards			
	Bowl	Tungsten carbide advanced wear protection			
PROTECTION	Gaskets	High wear and corrosion resistant > 04			
	Seal	With wear and corrosion special protection system			
	Туре	Gears (G), Belts (B)			
TRANSMISSION	Lubrication	Oil bath (tailored on the FDA specifications)			
		Oil with forced circulation cooling system			
	Area	Safe area (SA), Hazardous area: ATEX Zone 2 (Z2) or Hazardous area: ATEX Zone 1 (Z1) 🕨 05			
INSTALLATION	Туре	On skid with control panel and ancillaries			
		Stand alone with control panel			
	Kits and systems	Activation of the solid discharge: manual (M) or automatic (A)			
SEPARATOR		Control panel			
OPTIONS		Inertization system			
		Counter pressure valve on light (L), heavy (N) or both liquid outlets (LH)			
		Constant level feeding system			
Plant					
	Kits and systems	Filtering unit			
		Additive unit			
		Homogenizing system			
PLANT OPTIONS	Kits and systems	Feeding pump			
		Flow rate measurment kit			
		Hosting system			









