



## Alfa Laval PureDry

### Waste fuel oil recovery and sludge minimization



#### Application

Unreliable fuel oil prices and more stringent emissions controls are putting increasing pressures on ship owners and diesel power plant operators. To address these challenges and improve overall performance, owners and operators are undertaking measures, such as reduced engine speed and the introduction of emission control technologies, to improve fuel efficiency and reduce emissions.

Waste fuel oil recovery from sludge and substantial sludge minimization achieved by Alfa Laval PureDry is also gaining ground as an effective fuel and emissions reduction method, according to the International Maritime Organization MEPC.1/Circ. 642 guidelines for oily waste (sludge) handling systems used in machinery spaces of diesel engine installations.

#### Alfa Laval PureDry

Reliable and effective, the PureDry waste fuel oil recovery and sludge minimization system is an automated modular system for the continuous recovery of fuel oil from waste fuel oil from machinery spaces of diesel engine installations onboard ships and in power plants.

PureDry typically separates waste oils into three phases:

- Water containing less than 1,000 ppm oil
- Oil containing less than 5% water
- Super-dry solids to be landed ashore as dry waste

The recovered fuel oil is returned to the fuel oil bunker tank for reuse.

Fuel is also saved indirectly by sludge minimization, due to the complete segregation of liquid and solid content. When oil and water are removed by PureDry, the small quantity of super-dry solids that remains can simply be landed as dry waste. This eliminates the need for sludge incineration, which results in the use of additional diesel oil and/or additional costs for landing sludge ashore.

Easy to install and easy to use, the system is compact and modular, providing installation flexibility and convenience. Intelligent automation provides operational flexibility, enabling adaptation to varying feed conditions without requiring additional process water or generating additional waste.

**Features and benefits**

*Substantial fuel savings.* By recovering fuel oil (FO) from waste oil for reuse, PureDry helps cut fuel bills by up to 2% and generally pays for itself within a few years after commissioning.

*Minimal solids handling and disposal costs.* PureDry removes the maximum amount of water from waste oil, reducing oily waste that requires costly onshore disposal by up to 99% while minimizing the amount of oily waste forwarded to downstream systems, such as bilge water treatment systems.

*Increased payload capacity.* PureDry significantly reduces waste oil and wastewater holding tank volumes, thereby increasing payload capacity.

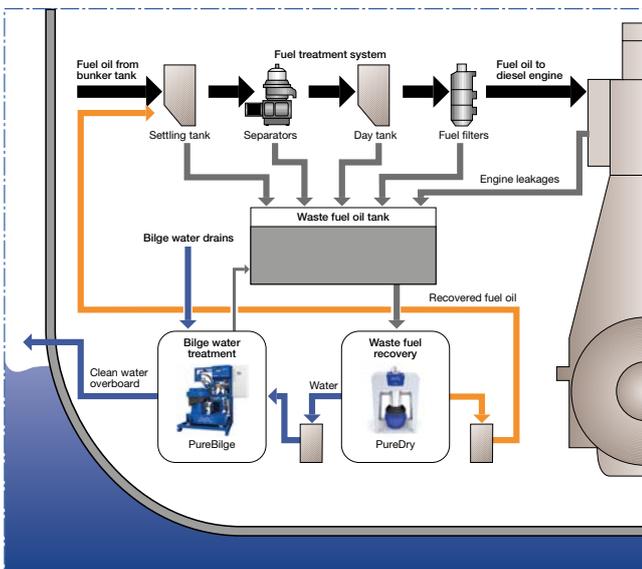
*Compact modular design.* PureDry is a modular system that enables compact and flexible installation in virtually any location.

*Enhanced environmental profile.* Waste fuel oil recovery and sludge minimization with PureDry enhances a company's environmental profile by reducing fuel consumption and eliminating spent fuel incineration, which results in emissions and thereby a larger carbon footprint.

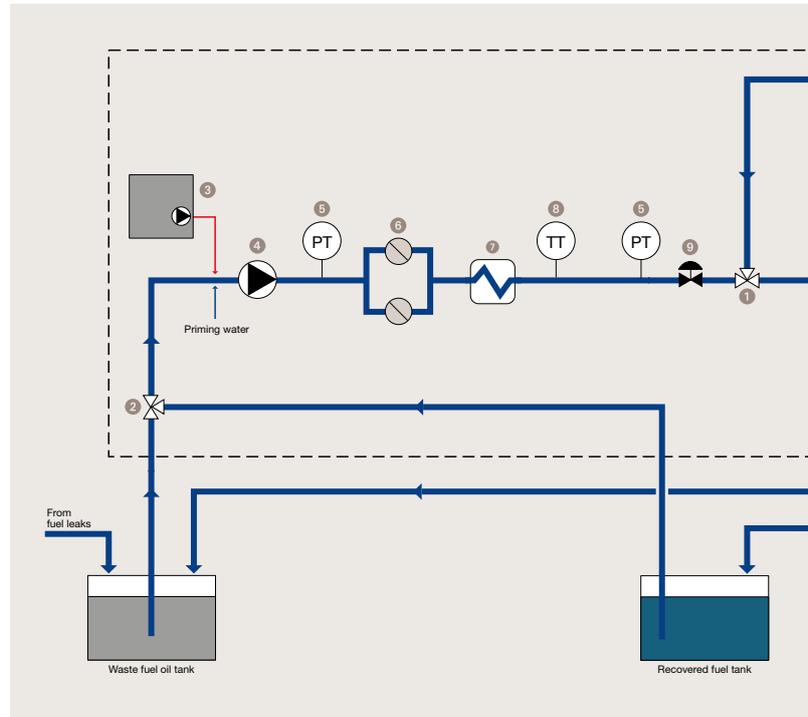
*Easy, automated operation.* PureDry starts and stops at the push of a button, continuously monitors operation and easily integrates with existing systems for local or remote control.

*Robust and stable.* New heater and software specifically designed for waste fuel oil enable robust and stable operations. Also newly added heat tracing element at the valve block prevents clogging of sludge inside the system.

*IMO compliance.* PureDry is IMO-compliant in accordance with MARPOL rule MEPC.1/Circ.642, which encourages the recovery and reuse of FO fraction as fuel.



The PureDry waste fuel oil recovery and sludge minimization system with integrated bilge water treatment.

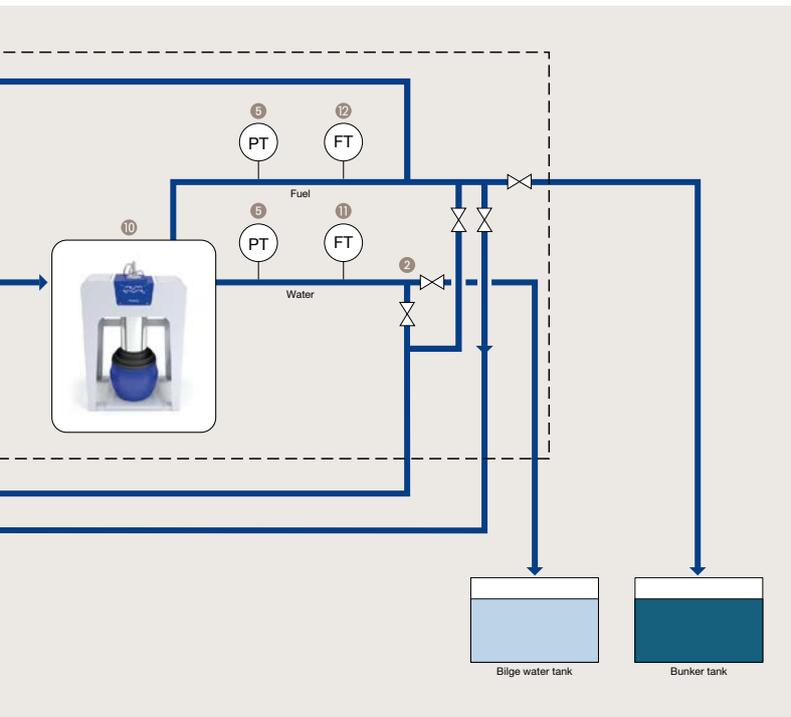


The PureDry system flow chart.

**System components**

The PureDry scope of supply includes everything needed for a complete waste fuel oil recovery and sludge minimization system. The system has five key components: the BX 50 separator, heater unit, pump unit, demulsifier unit and control unit.

- 1 *Three-way valve*  
Directs the feed from the heater to the separation stage.
- 2 *Three-way changeover valves*  
Directs the treated media to different tanks depending on process status.
- 3 *Demulsifier dosing unit*  
Enhances separation efficiency by adding Alfa Laval demulsifier to the feed.
- 4 *Feed pump with electric motor*  
Transfers oily waste to the heater.
- 5 *Pressure transmitters*  
Measures the pressure in the inlet and outlet and signals the process controller.
- 6 *Duplex strainer*  
Traps large particles in the feed before it enters the heater.
- 7 *Shell-and-tube heater*  
Raises temperature of the feed to the required treatment temperature of 95°C.
- 8 *Temperature transmitters*  
Measures the temperature of the liquid from the heater and signals the process controller.



- 9 *Constant pressure valve*  
Ensures stable feed conditions despite viscosity variations.
- 10 *BX 50 high-speed centrifugal separator*  
Continuously separates oily waste into oil, water and solids.
- 11 *Flow meter water*  
Measures the water flow rate out of the separator with high accuracy.
- 12 *Flow meter fuel*  
Measures the oil flow rate out of the separator with high accuracy using a full-flow meter.
- 13 *EPC 60 control unit (not pictured above)*  
Automatically regulates the operation of the BX 50 separator.

### Operating principle

A positive displacement feed pump directs the waste oil to the system at a variable flow based on the feed conditions. To enhance performance in the presence of stable emulsions, a chemical dosing unit is included. The unit is connected before the pump in order to mix Alfa Laval demulsifier directly into the feed.

The process liquid then passes through a strainer, which traps large particles, and into a pre-heater. A three-way change-over valve directs the waste fuel oil to the separation stage if all process conditions, such as feed temperature and feed pressure, are met. During an alarm situation, loss of operating pressure, power failure or when any preset condition is not met, the three-way valve re-circulates the fluid back to the waste oil tank(s).

For optimum separation efficiency, the heater raises the temperature of the unprocessed liquid to the desired feed temperature of 95°C.

The BX 50 high-speed centrifugal separator continuously processes waste fuel oil, separating oil, water and solids. The separator bowl containing a disc stack rotates at high speed, and solids from the waste oil feed accumulate at the bowl periphery.

From the periphery, solids are continuously discharged by a patented spiral-shaped device called the XCavator into a container under the separator. The amount of solids accumulated is continuously monitored by means of a load cell.

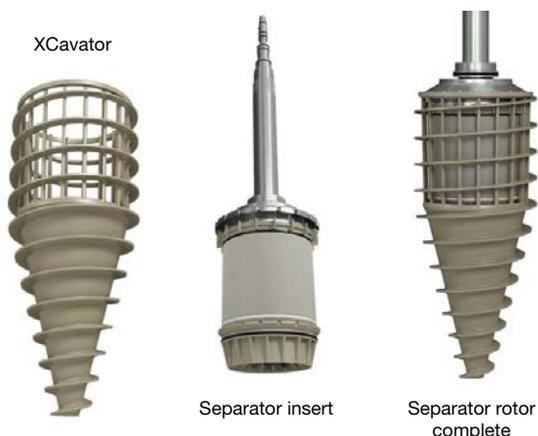
An oil paring disc, which forms part of the separator bowl, continuously discharges recovered oil from the separator through the oil outlet under pressure. The oil is directed to the recovered fuel oil tank. A built-in water paring disc continuously discharges separated water through the water outlet. Although sealing water is added to the bowl during start-up, no more water needs to be added, thus no additional waste is created by the process itself.

The separated water is then transferred either to the ship's bilge water treatment system for further processing to ensure that it meets IMO standards for discharge overboard, or to another downstream treatment system, or back to the waste oil tank, depending upon the process conditions.

The process is continuously monitored and controlled by the EPC 60 control system for fully automatic operation.



Cross-section of separator interior.



The Maintenance and Service by Exchange (MSE) Kit for the PureDry waste fuel oil recovery and sludge minimization system.

### Solids production

The typical amount of super-dry solids produced when processing fuel from a diesel engine running on FO is approximately 25–50 g/MWh, which is roughly equivalent to the production of 10–20 kg of solids every 24 hours.

### Capacity and sizing

The PureDry system operates at a throughput capacity of up to 500 litres per hour, depending on the amount of emulsions and whether the chemical dosing unit is used.

The system is designed to handle all HFO waste produced at a diesel power plant or on board a large ship with an engine size of up to 80 MW.

Calculations based on the estimated waste fuel oil production for a particular installation will determine the number of PureDry systems required to provide adequate coverage.

## Technical data for main components

### Power supply and connections

Power supply voltage	Three-phase, 400 V up to 690 V (for other voltage, transformer is supplied)
Power supply frequency	50 or 60 Hz
Power consumption	Max. 7 kW (complete system)
Instrument air	
Separator	ISO G 1/4"
Heating module	ISO G 1/2"

### Operating water

Separator	ISO G 1/2"
Feed pump unit	ISO G 3/4"
Steam inlet	DN 15
Operational limits	
Feed flow	Max. 500 l/h
Feed temperature	Min. 50°C, max. 95°C
Ambient temperature	5°C to 55°C
Acidity of feed	> pH 5
Maximum allowed density of operating liquid	1,000 kg/m <sup>3</sup>
Operating water	Min. 3 bar, max. 6 bar
Operating air	Min. 5 bar, max. 8 bar

### Net weights

Separator	310 kg
Control panel	190 kg
Heating module	220 kg
Chemical dosing unit (empty)	40 kg
Feed pump unit	86 kg

### PureDry Maintenance and Service

PureDry is supplied with a Maintenance and Service by Exchange (MSE) Kit, which includes a separator insert (rotor and disc stack), a bearing housing and a consumables kit. Replacement of the separator insert is recommended every nine months.

The MSE Kit enables service to be conducted with minimal downtime. Upon replacement, used parts should be returned to the nearest Alfa Laval Service Center and a new MSE Kit will be sent from Alfa Laval for use in order to maintain the equipment in good operating condition.

Alternatively, the separator insert and bearing housing can be easily overhauled on board by the crew or on site by the operator of a diesel power station.

Alfa Laval reserves the right to change specifications without prior notification.

### How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at [www.alfalaval.com](http://www.alfalaval.com)