



Oily Process Water Treatment

Pall Clarisep System

Introduction

Pall **Clarisep** crossflow filtration systems are designed for the treatment of parts washing fluids and oily wastewater such as used machine tool coolant.

Pall **Clarisep** removes tramp oil, suspended solids and bacteria from aqueous solutions to either maintain the fluid in an optimum condition for extended service life, or to process waste fluids to minimize the volumes that have to be disposed of offsite.

Pall **Clarisep** crossflow systems are fully automated, user friendly and simple to operate with minimal supervision.

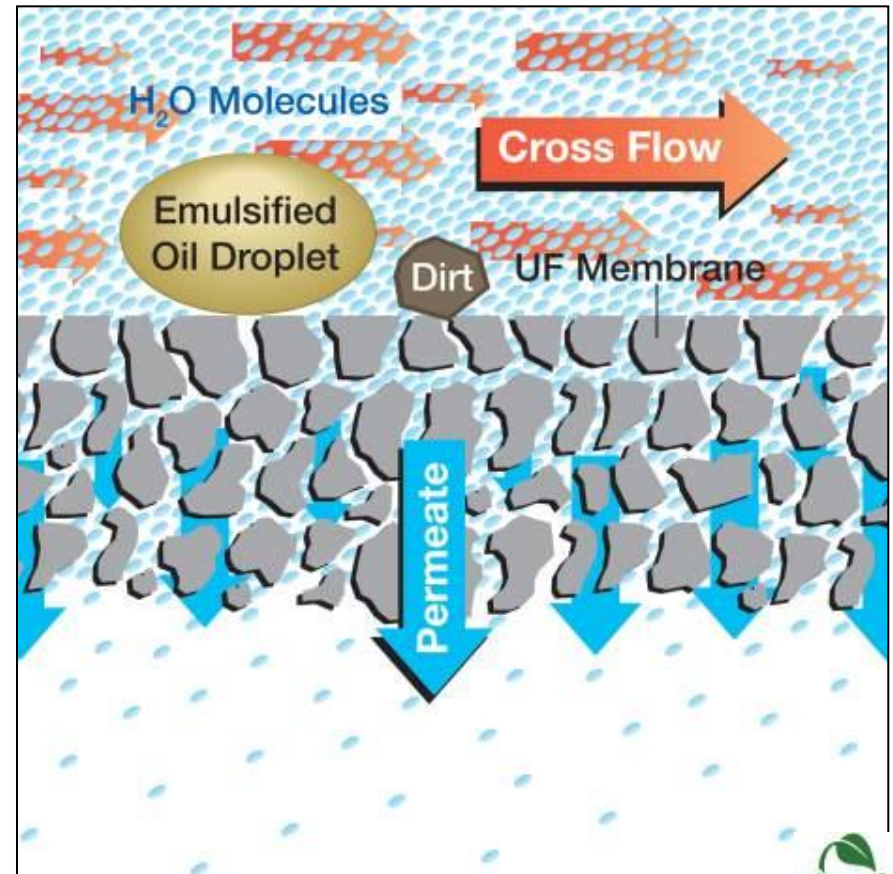


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Basic Principles – Crossflow Filtration

Clarisep systems are designed to keep, and concentrate oil, suspended solids and bacteria in the retentate.

The grades of membranes are rated by Molecular Weight Cut Off (MWCO) or μm . This allows us to tailor the level of filtration to allow, for example, water molecules to pass through the membrane, while retaining the larger oil molecules, solids, fungi and bacteria.



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Application

Parts Washing

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Introduction to Washing Fluid

Function of wash fluid is:

- To remove contamination such as swarf, dirt, coolant fluid, lubricating oil and grease from the surfaces of system components
- To achieve the required component cleanliness standard
- Where required protect the component from corrosion

Wash Fluid Properties:

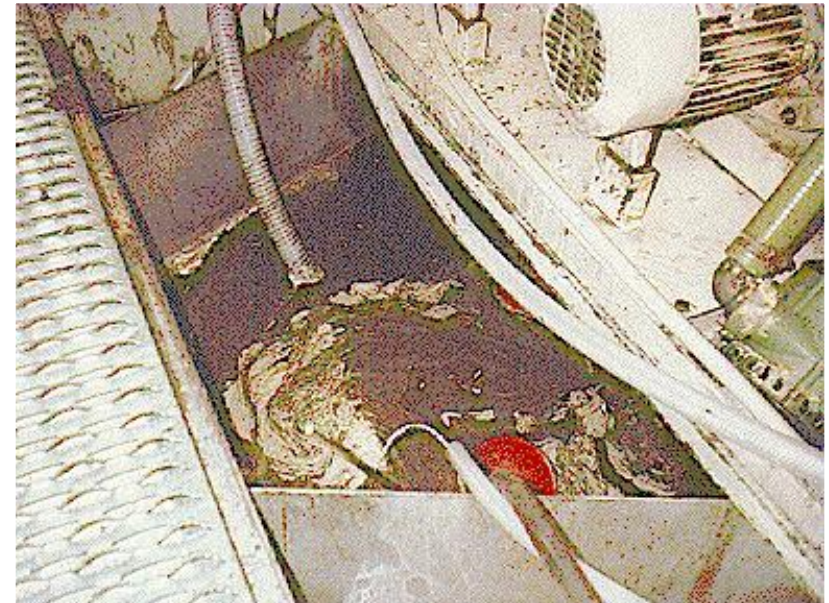
- Typically aqueous / water based alkaline solutions (Alternative: solvents wash)
- Appearance clear when new
- Formulation may include surfactants (wetting agents), emulsifiers, corrosion inhibitors, anti-foam additives, bio-resistant agents and pH buffers
- Surfactant ensures fluid has low surface tension to provide good wetting and spreading properties
- Available for immersion and spray washing method.
- Concentrate content of final water mix typically 1 to 4%
- Fluid undercuts the interface between contaminants and surface for easy detachment and removal by fluid.

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Contamination in Washing Fluid

Typical Contamination in Washing Fluid

- Tramp Oil
- Bacteria
- Fungi
- Sludge
- Gel
- Suspended Solid



Typical Contamination in Washing Fluid

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Types and Conditions of Tramp Oil

Tramp oil can appear in the washing fluid in several different forms. The type of tramp oil formation is influenced by fluid type, additives, temperature and etc.

- **“Free”** Tramp Oil.

Oil that has separated and is floating on top of the fluid

2. **“Dispersed”** Tramp Oil.

Oil that is mechanically spread throughout the system, given time this oil will separate and typically rise to the surface.

3. **“Emulsified”** Tramp Oil

Oil that has become dispersed in the fluid and will remain as a stable emulsion over an extended period of time.

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The Effects of Tramp Oil

Tramp Oil will be introduced to the system constantly as part of the washing process. If nothing is done to remove the tramp oil from the washing fluid, it will have the following negative effect to the washing process.

1. Poor Wash Performance

Beside removing particulate contamination, part washers also function to remove any oils and grease that have been carried over on the component from previous operations. Tramp oil can leave residue on components after the wash process leading to quality concerns and non conformance to specifications. Any oil left on the components may also cause problems with further processes in the production, for example sealing/coating processes and electronic beam welding.

2. Bacteria/Fungi

As the tramp oil collects on the surface of the coolant, it seals off oxygen creating anaerobic conditions for sulphate reducing bacteria which feed on the tramp oils. These bacteria cause health and safety concerns as well as very unpleasant odours.

3. Filtration performance

Tramp oils can blind filter media, leading to premature paper belt indexing and cartridge/bag changes.

4. Nozzle blockage

Tramp oils could cause washing machine nozzle blockage results in low wash performance and frequent maintenance.

These negative effects lead to high parts rejection, machine down time, frequent fluid and filter changes thus increase production, operation, maintenance and disposal cost.

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Benefit of Pall Clarisep

Typical conventional systems such as oil skimmers, centrifuges and coalescers only remove free and some dispersed Tramp Oil. The removal efficiency of oil skimmer and centrifuge units are typically low and unrated.

Pall Clarisep system is designed to concentrate and remove tramp oils, bacteria, fungi and solid contamination, allowing customers to

- Improve washed part quality
- Increase wash fluid and filter service life
- Subsequently reduce downtime and increase productivity
- Reduce new fluid and filter change out cost
- Reduce waste fluid and filter disposal cost
- Re-use concentrated oil, making “Zero Waste” possible
- Reduce health, safety and environmental concerns

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Wash Fluid Recovery

Wash Fluid

A pump circulates used fluid through the Clarisep unit, separating tramp oils, greases, particulate contaminants and bacteria from solution.



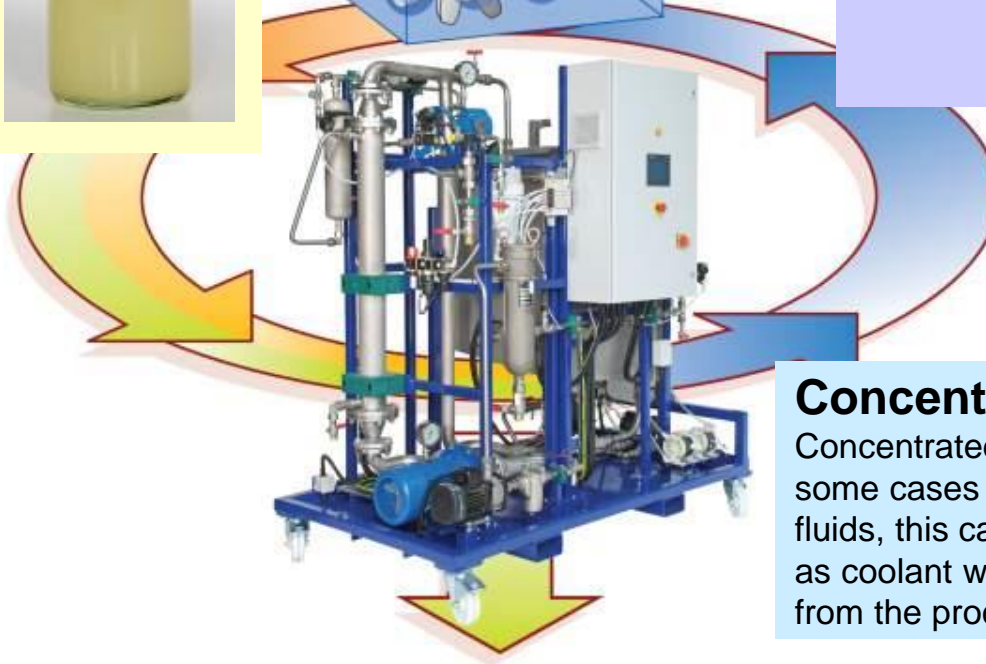
Permeate

The Cleaned fluid is recycled to the working system.



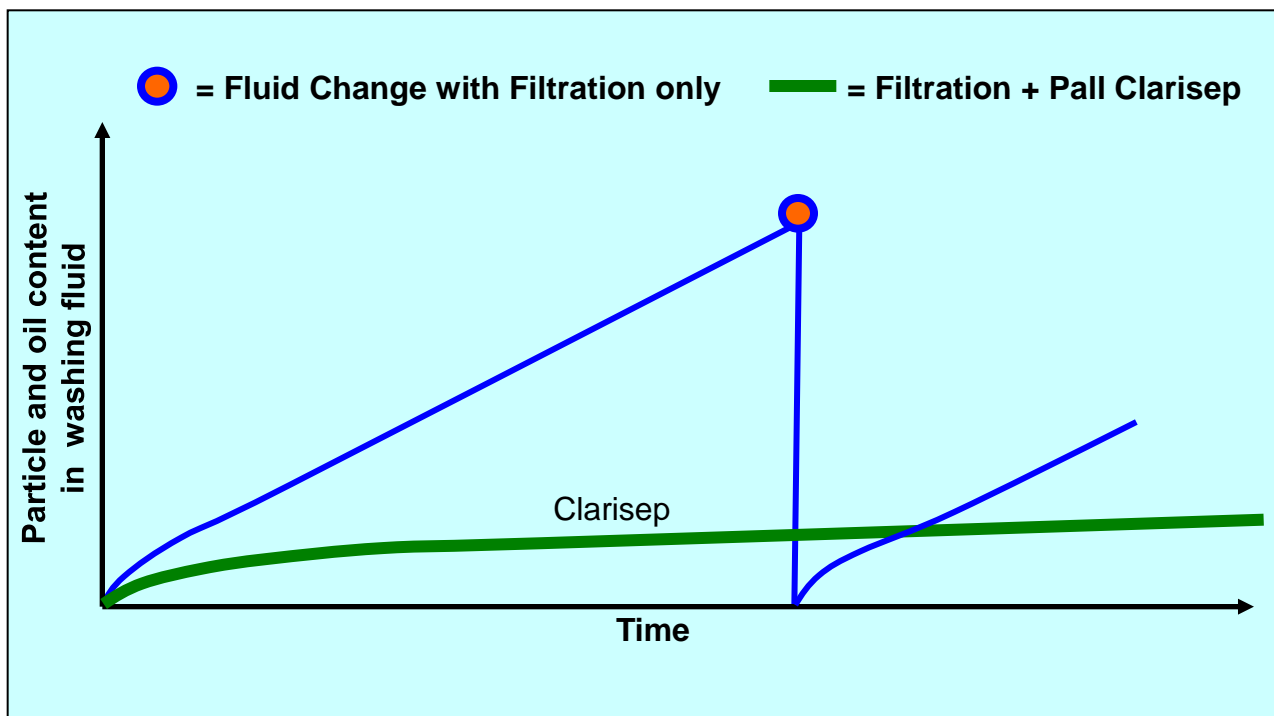
Concentrate

Concentrated tramp oil. In some cases with certain fluids, this can be re-blended as coolant with no fluid waste from the process.



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Improve Wash Fluid Service Life



**Condition
change
based on DI
or RO water**

Clarisep maintains both particulate and oil concentration below the specification. By controlling both particulate and oil levels, the fluid service life can be extended significantly.

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Clarisep Benefits on Wash Fluid Application

- Maintain wash at optimum performance
- Cleaner components to specification
- Consistent wash performance
- Extended wash fluid service life
- Reduced maintenance and labor costs
- Minimized of fluid disposal costs
- Reduced machine/line downtime
- Reduced reheating costs on hot washes

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Application

Oily Wastewater

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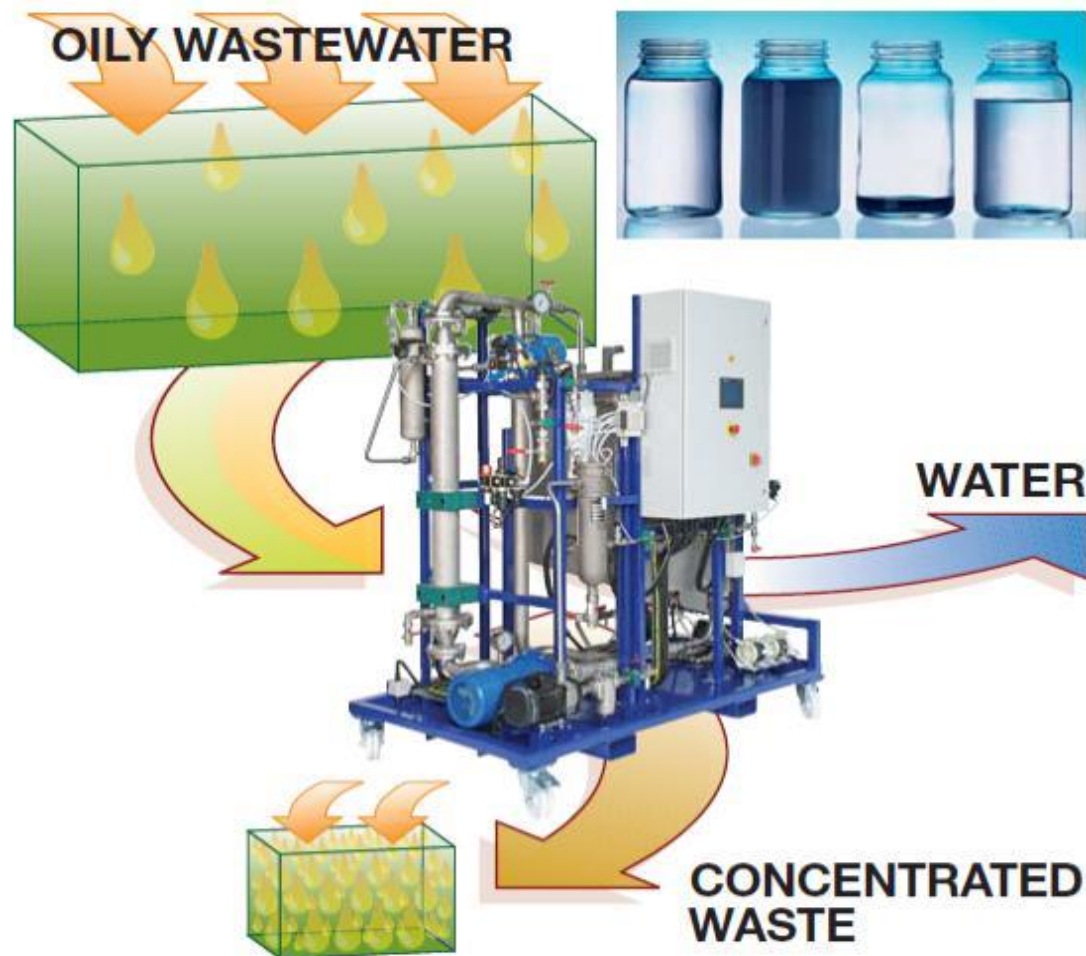
Industrial Oily Waste Water

Typical Industrial Oily Wastewater

- Aqueous based machine tool coolant
- Aqueous washing fluid
- Machine wash down water
- Cooling/ Process/ Drain water contaminated by oil leaks
- Run off water

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Oily Wastewater



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Result of Pall Clarisep System on soluble coolant

Typical Results	COD (mg/L)	TOG (mg/L)
<ul style="list-style-type: none"> • Before Pall Ultrafiltration • After Pall Ultrafiltration 	<p>>198,500</p> <p>3,340</p>	<p>>50,000</p> <p>4.0</p>

TOG results can be vary depending on the method used for analysis ,
e.g. EPA 1664 can give higher results due the analysis technique

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Result of Pall Clarisep System on soluble coolant



**Clear permeate
usually indicates a lower COD**



**Darker coloured permeate
usually indicates a higher COD**

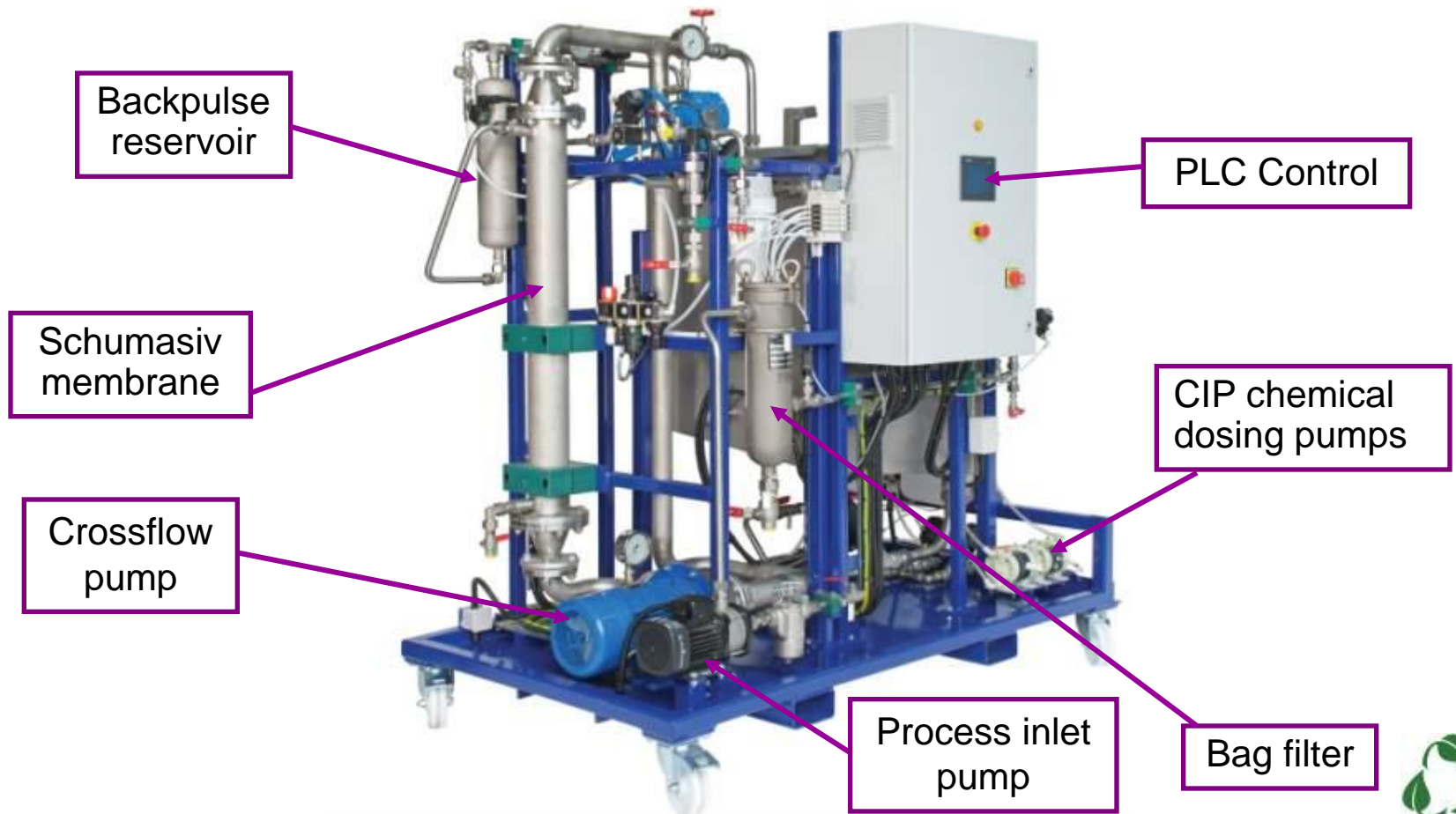
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Clarisep Benefit Summary on Oily Waste Water Application

- Reduce disposal and treatment costs of oily wastewater
- Enhanced environmental protection
- Reduction in incoming water costs, if reusing some or all the permeate for other processes

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Clarisep System Overview



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Key Features of Pall Clarisep System

- Pall Schumasiv™ ceramic membrane
- Fully automated operation
- Long membrane life (up to 7 years) with automated membrane regeneration
- Consistent high permeate flow with automated flux maintenance
- Automated thermal shock protection
- Wide operating temperature range (5 to 80 °C/ 41 to 176°F)
- Compact, mobile or fixed system with small footprint
- Automatic flush and soak of membrane with CIP chemical for prolonged shut down to preserve membrane life

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Clarisep Technical Specification

	<u>SIZE 1</u>	<u>SIZE 2</u>	<u>SIZE 3</u>
Dimension (Max): (W X D X H)	1118 X 1984 X 2112 mm (44.0 X 78.1 X 83.1 Inches)	1321 X 2200 X 2371mm (52.0 X 86.6 X 93.3 Inches)	1321 X 3200 X 2591mm (52.0 X 125.9 X 102.0 Inches)
Dry Mass:	1080kg (2380lbs)	details to follow	1800kg (3968lbs)
Inlet/Outlet connection [^]			
Feed:	½" BSPP	¾" BSPP	1" BSPP
CIP Feed Water:	¾" BSPP	¾" BSPP	¾" BSPP
Permeate:	½" BSPP	½" BSPP	¾" BSPP
Drain to Recovery:	1" BSPP	1" BSPP	1" BSPP
Drain to Waste:	1" BSPP	1" BSPP	1" BSPP
Compressed Air:	12mm push-in (3/8" Taper)	12mm push-in (3/8" Taper)	12mm push-in (3/8" Taper)
Membrane Area:	2.45m ² (26.4 Feet ²)	5.46m ² (58.8 Feet ²)	10.14m ² (109.1 Feet ²)
Feed Flow Rate:	17l/min (4.5GPM)	33.3l/min (8.8GPM)	50l/m (13.2GPM)
Est. Permeate Flow:*	5 -10l/min (1.3 – 2.6GPM)	10 – 20l/min (2.6 – 5.3GPM)	20 – 40 l/min (5.3 –10.6GPM)
Fluid Operating Temp:	Max 80°C (176°F)	Max 80°C (176°F)	Max 80°C (176°F)

Pall Clarisep™ crossflow filtration system is CE certified.

[^] BSP to NPT adapter included

*Subject to application parameters

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