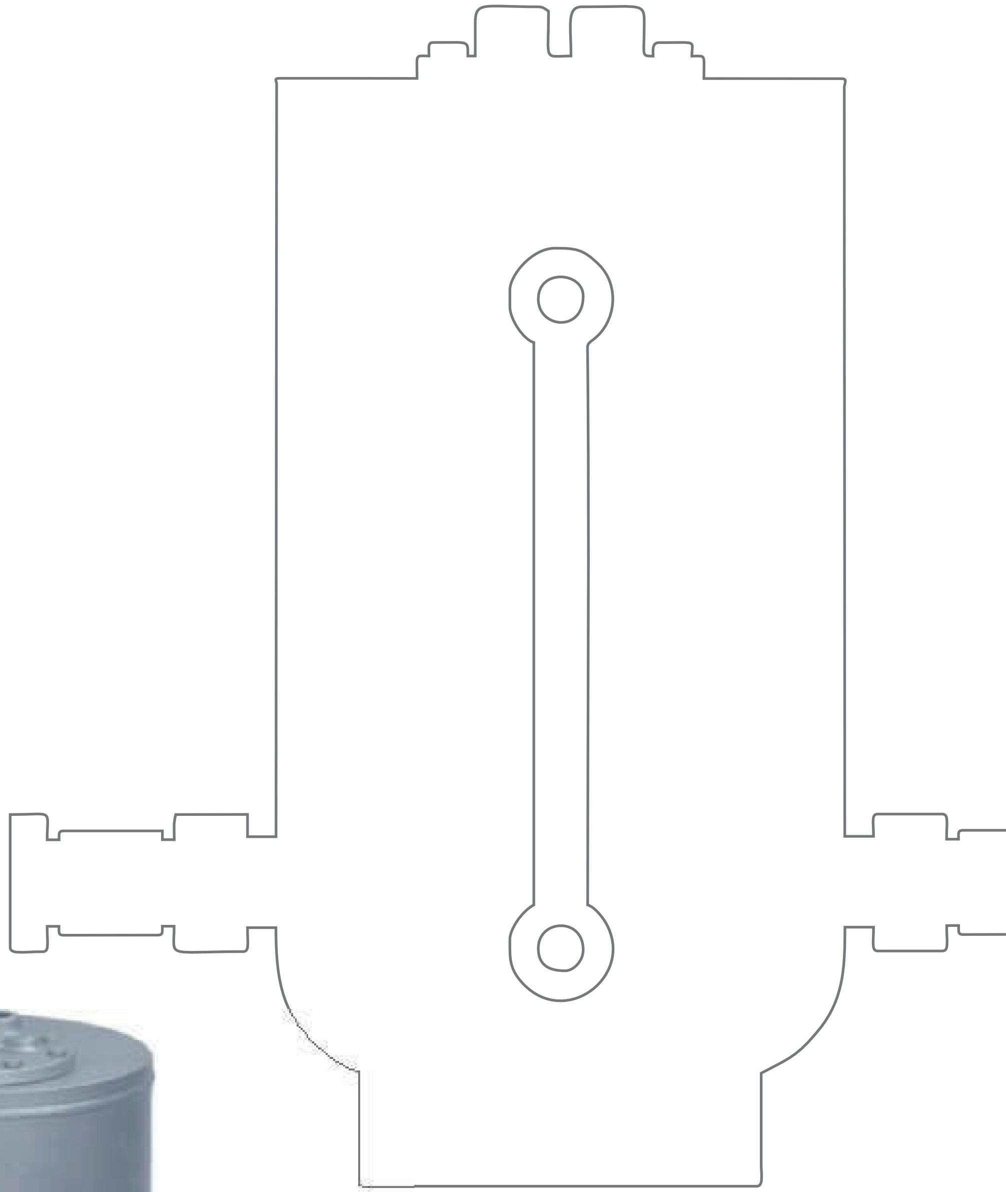
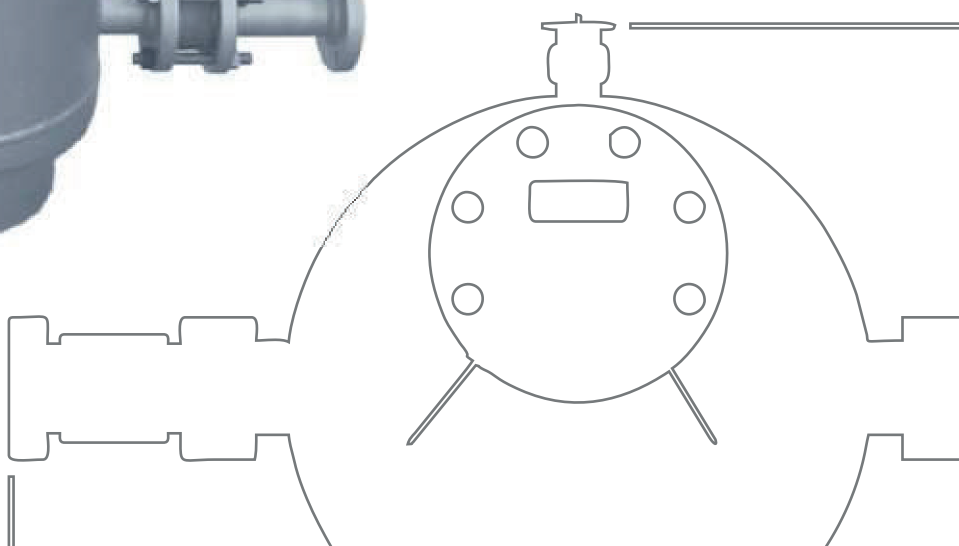
pennant®
LEAD THE WAY

PCB-10

Condensate Recovery Systems





Description:

The Pennant condensate pump (PCP-10) is an excellent alternative to standard electric pumps which are not suitable for pumping hot condensate. It is a complete non-electric solution designed to lift condensate to the boiler feed-water tank, using small quantities of motive steam/air.

Features:

- Intrinsically safe for use in hazardous areas since there are no electric connections
- Works in remote areas where electric supply is not available
- Not prone to wasteful leaks as there are no rotating parts with mechanical seals
- All stainless steel internals give excellent corrosion resistance for long trouble-free service
- Exceptionally low cost of operation and maintenance

Sizes: (DN): 25 x 25, 40 x 40, 50 x 50, 80 x 50, 100 x 100

End Connections:

- Flanged #150, #300 as per ASME B16.5
- Screwed (NPT/BSPT/BSP)

Typical Configuration:

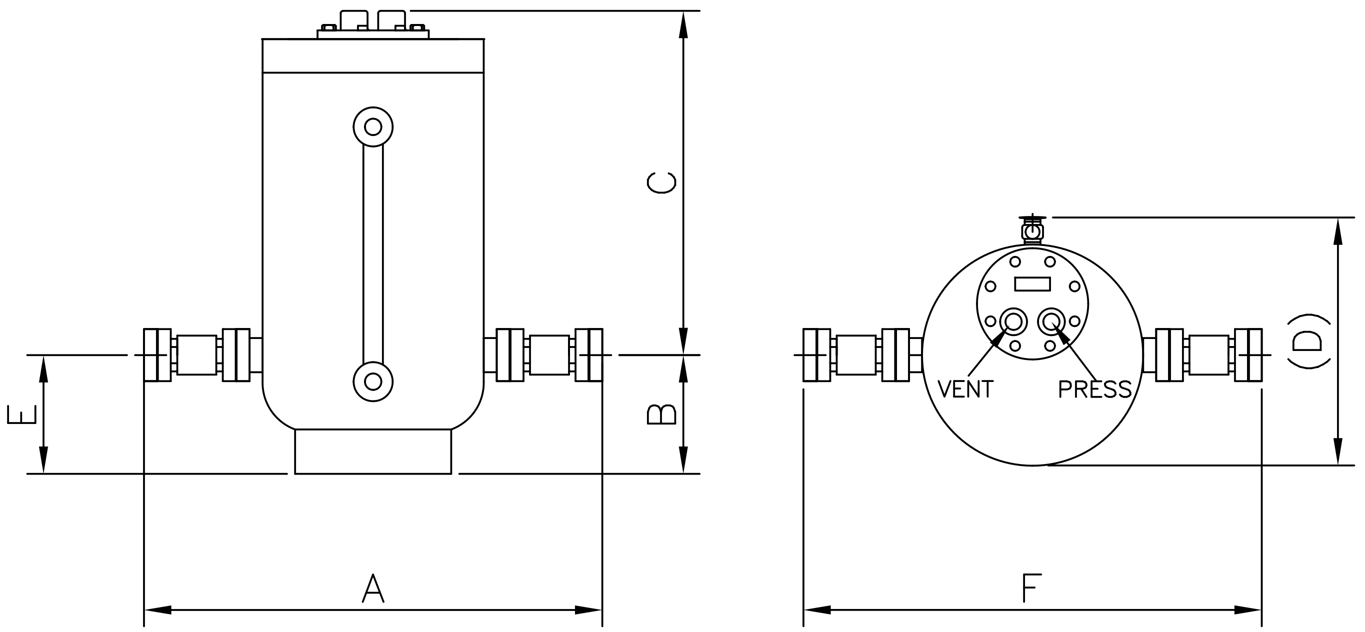
•Stand Alone Unit: A stand-alone unit consists of a pump tank, inlet-outlet check valves & internal pumping mechanism.

•Pump with R eceiver Tank: In this configuration, there can be multiple pumping units, all fed from one receiver tank. The entire assembly is mounted on a common base. Depending on the number of pumping units, these are classified as

A) Simplex: One pumping unit with check valves and one receiver tank skid-mounted
B) Duplex: Two pumping units with check valves and one receiver tank skid-mounted
C) Triplex: Three pumping units with check valves and one receiver tank skid-mounted

Limiting Conditions:

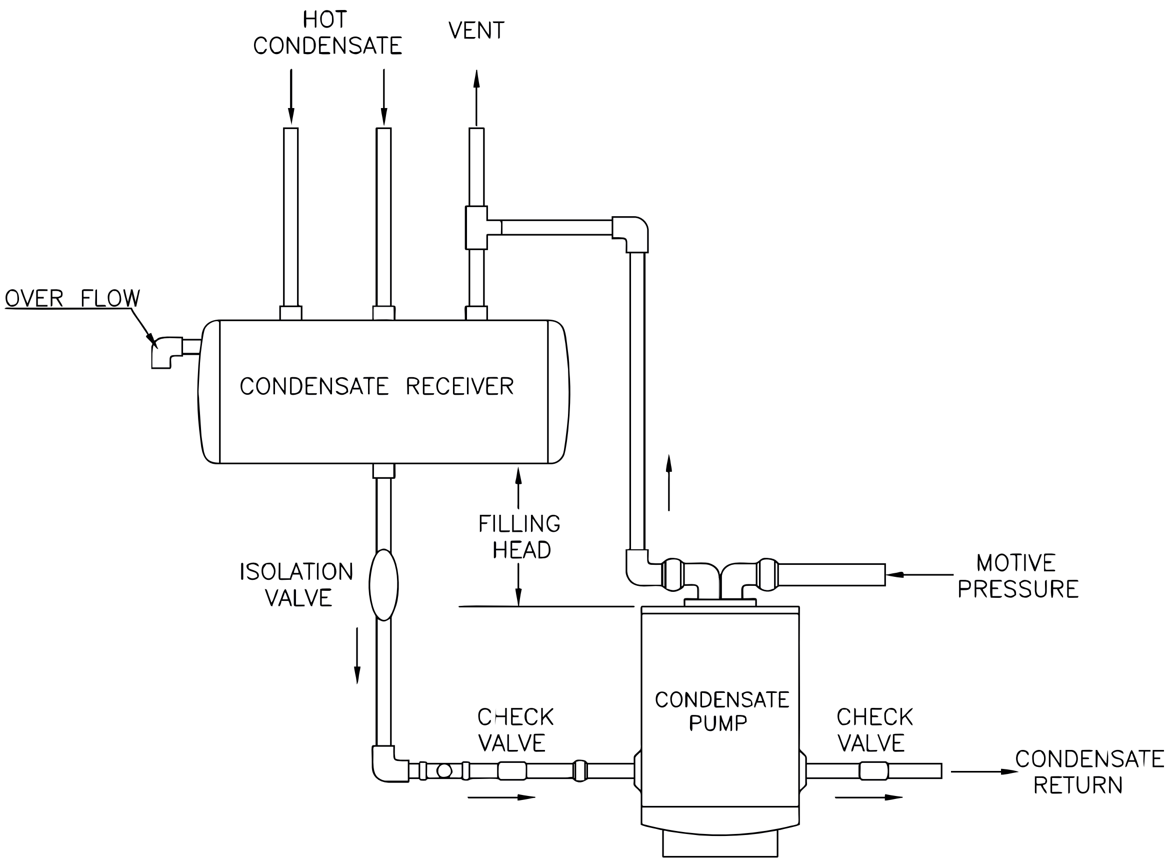
PMA : Maximum allowable pressure	15 kg/cm^2
TMA : Maximum allowable temperature	380^{0}C
PMO : Maximum operating pressure	10.5 kg/cm^2
Cold Hydro Test Pressure	30 kg/cm^2



A: F or threaded ends.
F: F or flanged ends

Inlet x Outlet (DN)	Dimensions (mm)						Weight (kg)	
	A	B	C	D	E	F	Threaded	Flanged
25 x 25	685	135	405	450	135	865	80	88
40 x 40	720	135	405	450	135	940	82	98
50 x 50	790	250	550	450	250	1015	100	128
80 x 50	845	250	550	450	280	1055	105	141
100 x 100	2080	240	980	*	240	2085	-	500

*Contact our representative for dimension 'D' of the DN100 x DN100 version



Operation Principle:

Liquid to be pumped enters the pump tank via the inlet check valve – the vent valve is open and the steam/air valve closed. As the liquid level rises in the tank, the float rises. When the liquid level reaches its 'high level', the compression spring simultaneously forces the vent valve to close and the motive steam/air (pressure) valve to open. The pressure forces the liquid through the exit check valve. During the pumping cycle, the float drops as the liquid level recedes to the 'low level'. The action of the compression spring then simultaneously forces the vent valve open and the motive steam/air valve closed. Pressure in the pump tank is released through the vent, and liquid to be pumped enters through the inlet check valve repeating the cycle.

Capacity Chart for Selection:

Motive Pressure (kg/cm²)	Total Lift (kg/cm²)	Capacities (kg/hr) Pump Size - Inlet x Outlet (mm)				
		25 x 25	40 x 40	50 x 50	80 x 50	100 x 100
10.55	1.1	1159	2114	3318	5591	19600
	2.8	1091	2023	3091	5091	17314
	4.2	1023	1750	2955	5000	15477
8.79	1.1	1159	2114	3318	5591	19545
	2.8	1068	2023	3091	5227	17273
	4.2	1023	1750	2955	5000	15455
7	1.1	1159	2068	3273	5500	18864
	2.8	1068	1886	3000	5136	16636
	4.2	977	1614	2864	4864	14545
5.3	1.1	1114	1886	3314	5500	18727
	2.8	1068	1705	2864	4818	15227
	4.2	886	1523	2455	4182	11818
3.5	0.7	1114	1773	3136	5318	18727
	1.8	1068	1636	2864	4818	15000
	2.8	886	1432	2364	4045	11136
1.8	0.4	1023	1864	3000	5136	*
	0.7	932	1727	2773	4727	
	1.1	886	1455	2500	4273	

*Contact our representative for check valve specifications. Use of any other check valve may alter pump performance.

HOW TO SIZE THE CONDENSATE PUMP:

In order to size the condensate pump, following information is required:

- Condensate load (kg/hr)
- Required delivery head (feet)
- Line pressure in the condensate return piping (kg/cm^2)
- Available filling head (feet)
- Motive pressure (steam/ air/ gas) available for pump operation (kg/cm^2)

Example:

- Condensate load to be pumped: 2730 kg/hr
- Required delivery head: 10 feet
- Pressure in the condensate return piping: 2.5 kg/cm^2
- Motive pressure: 7 kg/cm^2

Step – I

Calculate the total back pressure against which the condensate must be pumped -

Total back pressure = (Required delivery head X 0.03) + Pressure in the condensate return piping

= (10 x 0.03) + 2.5

= 2.8 kg/cm^2

Step – II

Select the pump from the capacity chart where the motive pressure is 7 kg/cm^2, total lift is greater than or equal to 2.8 kg/cm^2 & condensate capacity is greater than or equal to 2730 kg/hr. The resulting selection would be a DN 50 x DN 50 pump with a minimum required filling head of 1 foot. It will pump 3000 kg/hr providing an overall capacity of 110% of required flow.

Optional Accessories:

- Cycle counter to count the number of pumping cycles
- Insulating Jacket to reduce radiation losses from the pump body

Savings:

Returning hot condensate to the boiler has several benefits:

- Savings in boiler feed-water - only make-up water required - return of high purity condensate saves cost of water treatment and saves water
- Fuel saving due to utilization of the energy from hot condensate
- Less condensate discharged into the sewer reduces disposal cost
- The mechanical (non-electric) operation of the PCP-10 saves the cost of power required to run an electric pump

Example of savings made:

Consider a steam system that returns 8500 kg/hr of condensate at 80°C using a PCP-10 condensate pump. Assume that this system operates 8000 hours annually with an average boiler efficiency of 80% and a make-up water temperature of 10°C. The make-up water cost & sewage treatment costs for the plant is Rs.10 per cubic meter. The fuel cost is Rs.180 per GJ (gega joules)

Annual saving in raw water and treatment costs:

= (Condensate Load, kg/hr) x Annual Operating Hours x (Total Water Costs, Rs./m^3)/(Water Density kg/m^3)

$$= \frac{8500 \times 8000 \times 10}{1000}$$

Annual water saving = Rs.6,80,000/-

Annual fuel saving:

The condensate not returned to the boiler must be replaced by an equal amount of fresh make-up water.
Heat required to raise the temperature of cold make-up water from 10°C to 80°C = $m \times Cp \times \Delta T$

Q annual = 8500 kg/hr x 8000 hr x 4.19 KJ/kg x 70 = 19,944 GJ
With the boiler running at an efficiency of 80%,
The actual annual heat energy required would be = 19944/0.8 = 24930 GJ

Considering a fuel cost of Rs.180 per GJ,
The annual fuel saving will be : 24930(GJ) x 180 (Rs/GJ) = Rs.44,87,400/-

Total savings due to returned condensate: 6,80,000 + 44,87,400 = Rs.51,67,400/-

Simple payback period considering cost of installation of a condensate recovery system is around 30 to 35 Weeks.
(Local figures/conditions may vary from the assumptions made in the example)

How to Order:

PCP 10 :: 25 x 25 :: #150

Ordering Information:

- Condensate load (kg/hr)
- Required head for lifting condensate to the boiler feed-water tank (feet)
- Line Pressure/Back Pressure of Condensate return piping.
- Filling head available (feet)
- Motive pressure available for pump operation (kg/cm^2)
- Stand-alone unit or skid with receiver tank (Simplex, Duplex, Triplex)
- Motive fluid available – steam/air/gas

Local regulations may restrict the use of this product below the conditions quoted. Limiting conditions refer to standard connections only.
In the interest of development and improvement of the product, we reserve the right to change the specifications without prior notice.

pennant
pennantcorp.com

USA | 10 Parsonage Road, Suite 312 Edison, N.J. **[T]** 877- 597-TRAP (8727) **[F]** 1-866-682-1244 **[E]** info@pennantcorp.com

INDIA | 329, Sachapir Street, Camp, Pune 411001, Maharashtra **[T]** +91 20 6978 1118/9 **[E]** marketing@pennantcorp.com

November 2022