

# Condensate recovery solutions

Reduce your operating costs through the effective management of condensate

STEAM & CONDENSATE  
MANAGEMENT SOLUTIONS



*First for Steam Solutions*

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# Spirax Sarco's range of condensate recovery solutions are specifically designed to efficiently remove and recover condensate under all operating conditions

## Lower operating costs through efficient condensate management

In today's energy conscious environment, condensate has become a valuable resource that can be used to significantly improve steam plant efficiency.

Returning the highest possible percentage of condensate back to the boiler offers an exceptional return on investment by helping to cut energy and maintenance costs. Even recovering small quantities, such as the discharge from a single steam trap will, over time, result in a significant saving.

## Why should condensate be removed from your process equipment?

Removing condensate from your heat exchange and process equipment not only improves efficiency, it will also provide more stable operating conditions and prolong equipment life.

Efficient condensate removal prevents:

- Unstable temperature control
- Product quality problems
- Excessive corrosion of heating surfaces
- Waterhammer
- Noisy operation
- Equipment damage

Utilizing a Spirax Sarco condensate recovery system to effectively collect hot condensate from the steam and return it to the boiler house can pay for itself within a short period of time.

## How can returning condensate save you money?

Returning hot condensate to the boiler reduces the costs associated with water treatment and the energy needed to heat cold water make-up that will be on demand by the boiler.

### Lower make-up water costs

When condensate leaves the steam trap, it still contains approximately 25% of the original heat energy that was within the steam before condensing. If this hot condensate is not recovered and returned to the boiler, the boiler would need to be continually fed with cold make-up water.

### Lower chemical costs

Reducing the amount of fresh water make-up that enters the boiler also substantially lowers the amount of water treatment required - Again lowering operating costs.

### Compliance with environmental effluent standards

Restrictions and environmental regulations on the quality of the water returned to the public sewer, apply in most countries and effluent charges and fines may be imposed by water suppliers for non-compliance. Therefore higher costs are imposed if condensate is drained into a sewer rather than being returned to the boiler.

### Boiler feedwater quality

Since condensate is distilled water, which contains almost no total dissolved solids, returning more condensate to the feedtank reduces the need for blowdown. This reduces the concentration of dissolved solids in the boiler water, which in turn, lowers the amount of energy lost from the boiler.



## Mechanical fluid pumps - The sustainable solution to energy cost control

Spirax Sarco offers a complete range of mechanical fluid pumps specifically designed to remove and recover condensate under all operating conditions, optimizing plant efficiency and product quality throughout your plant.

Mechanical fluid pumps are typically installed with a receiver vented to the atmosphere – in what is usually termed an ‘open’ system - where condensate is collected from multiple steam traps and condensate is pumped to the boiler feedwater tank.

Mechanical fluid pumps are best used where multiple condensate sources are present and where it is practical to install a vent pipe.

### Pivotrol pressure powered pumps

Designed specifically to remove condensate under all operating conditions

Spirax Sarco offers a self-contained unit using steam or other pressurized gas as its motive power. There are no electric motors or level switches, simplifying installation and making it ideal for wet or hazardous areas. Featuring reliable PowerPivot® technology outperforms more complicated and expensive condensate handling systems. An added benefit is the ability to effectively pump high temperature fluids. Plant maintenance problems caused by leaking mechanical seals and cavitation are eliminated.

Material		Ductile Iron	ASME Coded Steel						
Model		PTC	PTF	PTF-SS	PTF-TOP/T-Bone	PTF-HP	PTF-HTF	PTF4	
Inlet	Outlet								
Size	2"	2"	•	•	•				
	3"	2"	•	•	•		•		
	3"	2"				•		•	
	4"	4"						•	
	PMO Maximum operating pressure		200 psig	200 psig	200 psig	200 psig	300 psig	200 psig	200 psig
	TMO Maximum operating temperature		400°F	400°F	400°F	400°F	650°F	750°F	650°F
	Maximum flow #/hr		17,640	17,640	17,640	17,640	28,750	11,819	50,560
	Maximum pump discharge/cycle		7.1 gal	8.4 gal	8.4 gal	8.4 gal	16 gal	8.4 gal	26.9 gal
Specific Gravity		.9-1.0 standard .8-.89 optional .65-.79 optional				.88-1.0	.65-.79	.88-1.0	

Note: Pump capacities are only for comparison between pump models. Please refer to product specific technical information sheets (TI's) for the full capacities of each model. See TI-5-030-US or contact your local Spirax Sarco representative for sizing help.



## Features and benefits of mechanical fluid pumps

- Removes condensate under all load conditions - Ensuring maximum process efficiency.
- No mechanical seals or packing glands to leak - Reducing maintenance costs.
- Requires no electrical power - Single trade for installation and repair.
- Suitable for hazardous and demanding environments.
- Cavitation problems eliminated, reducing maintenance costs - Zero emissions. No motive steam loss when installed in a closed system, reducing operating costs.
- Featuring Reliable PowerPivot® Technology - Designed for reliable trouble free service.
- Minimal Steam Consumption.
- Cycle Counter - Included for pump & system monitoring.
- High cycle life check valves - Specifically designed for pump use.
- Six-month payback or less - Call your local sales representative for payback analysis.



Material		Cast Iron	Cast Steel	Cast Stainless Steel
Model		PPEC-CI	PPEC-CS	PPEC-SS
Inlet	Outlet			
1"	1"	•	•	•
1½"	1½"	•	•	•
PMO Maximum operating pressure		125 psig	125 psig	125 psig
TMO Maximum operating temperature		450°F	450°F	450°F
Maximum flow #/hr		5,100	5,100	5,100
Maximum pump discharge/cycle		4.0 gal	4.0 gal	4.0 gal
Specific Gravity		.9-1.0 standard .8-.89 optional .65-.79 optional		

Note: Pump capacities are only for comparison between pump models. Please refer to product specific technical information sheets (TI's) for the full capacities of each model. See TI-5-202-US or contact your local Spirax Sarco representative for sizing help.

## PTF4 - for high capacity applications

The Pivotrol® PTF4 high-capacity pump is capable of pumping up to 40,000 lb/hr in rapid-cycling process environments and under elevated pressure and temperature conditions. Designed as a solution to excessive maintenance and energy consumption common with high-capacity condensate pumps used in large commercial and industrial facilities, the PTF4 offers higher performance than conventional technology, yet in a smaller package.



### Features and benefits of the PTF4

- **Low filling head** - Easy to install in confined environments.
- **Pump mechanism replaces old technology of pins and linkages with virtually wear and friction free pivots**
  - Increased service life and reduced maintenance costs.
- **Lifetime warranty on spring as standard** - Inconel® compression spring for peace of mind.
- **PowerPivot® technology utilizes carbide materials, which provide extreme hardness and resistance to wear**
  - Increased service life and reduced maintenance costs.
- **Maximum operating pressure of 200 psig (13.8 barg)** - High motive pressure increases pumps capacity rating.
- **Installed cycle counter** - Allows energy returned to the boiler house to be monitored.
- **Integral hydraulic paddle** - Specifiable difference that reduces high impact forces on the mechanism, motive and exhaust valves during operation increasing service life.

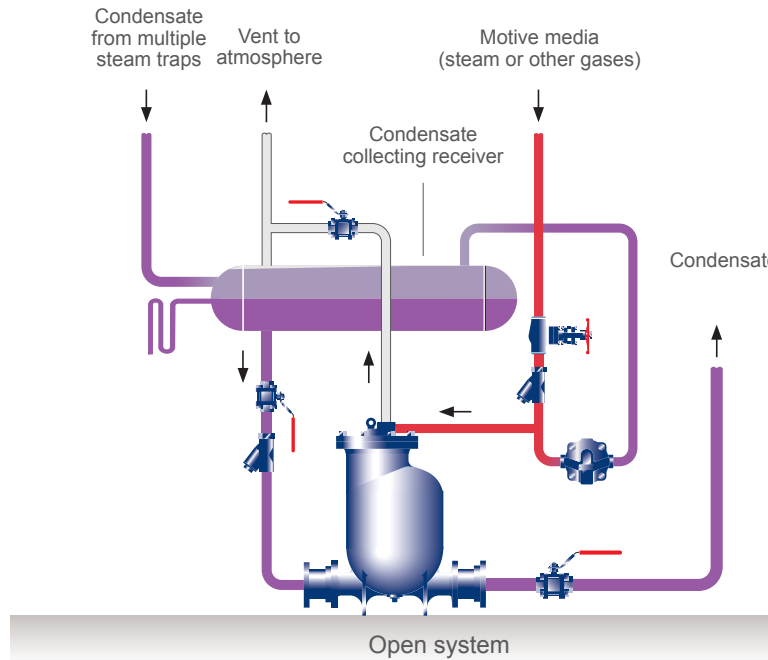




## Mechanical fluid pumps - Typical applications

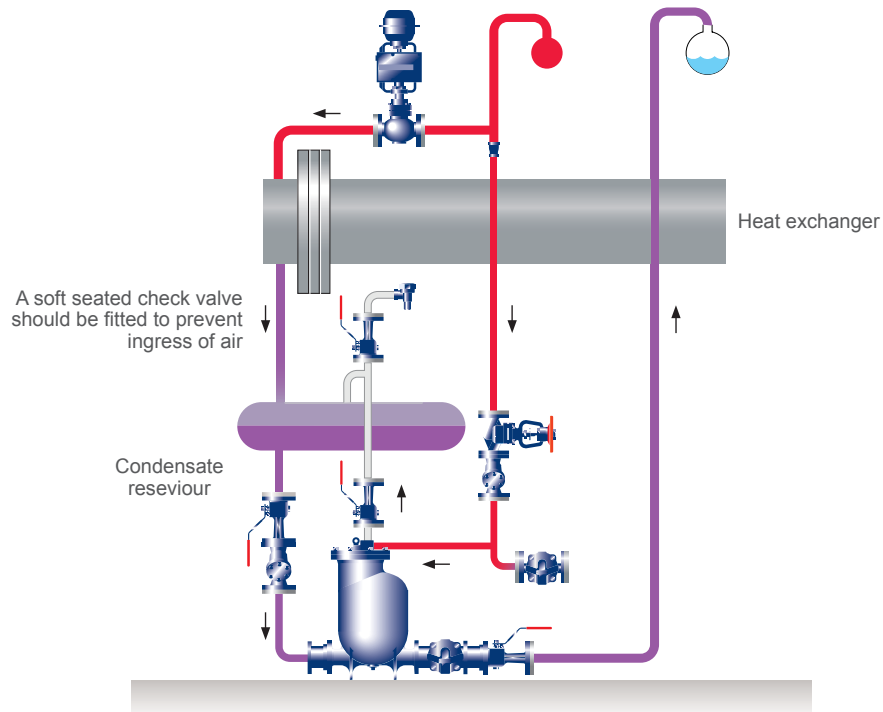
### Condensate recovery (open system)

Pumping high temperature condensate without cavitation or mechanical seal problems. Provides maximum heat energy recovery.



### Condensate removal from process vessels and heat exchangers (pump / trap combination, closed system)

Removal of condensate under all pressure conditions ensures stable temperatures. It also prevents bottom end tube corrosion and potential waterhammer and freezing.



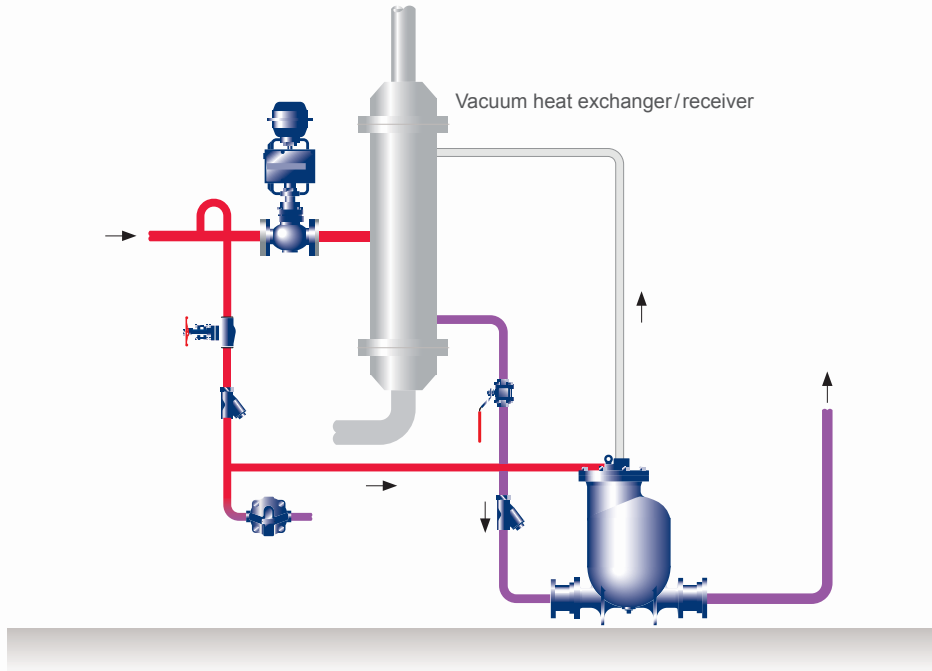
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**Condensate removal from vacuum equipment**

Simple and efficient solution to a difficult problem without the need for expensive electrical pumps and sensors.



## Automatic pump traps - Mechanical fluid pump and steam trap units combined

Spirax Sarco's range of automatic pump traps (APT) have been designed to help you achieve optimum performance from all types of temperature controlled process equipment, by removing condensate under all operating conditions.

Automatic pump traps are typically used to drain a single piece of heat transfer equipment, such as a heat exchanger, which usually involves fitting a small condensate collecting receiver between the equipment and the pump-trap. Since the receiver is not vented, this is most often referred to as a closed system.

The equipment is drained under all operating conditions and the condensate is usually recovered and returned to the boiler feedwater tank. So it will not be susceptible to waterlogging or stall.

Automatic pump traps should be used when the operation of temperature controls on plant equipment, such as heat exchangers, can create a 'stall' condition which prevents condensate flowing through the steam trap. This is because of insufficient differential pressure.



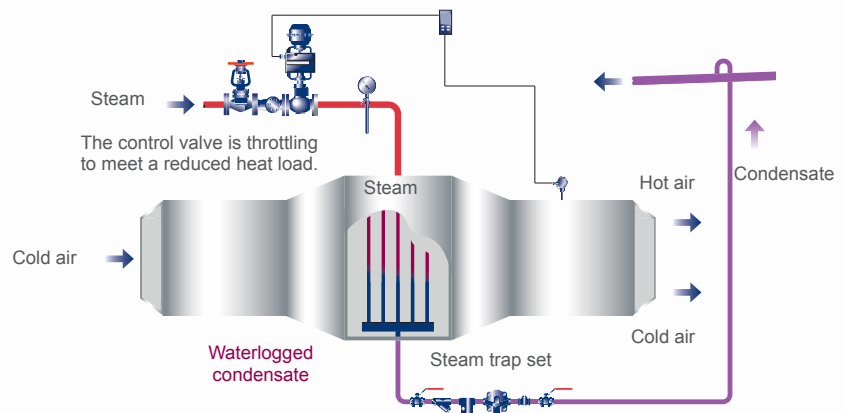
## Why is it essential to drain the system properly?

### Problem: an air heater suffering the effects of stall

Under stall conditions, partial or complete waterlogging may occur leading to:

- Temperature fluctuation - reduced heat output/reduced product quality.
- Corrosion of heating surfaces  
- damage to heat exchanger.
- Waterhammer noise and damage  
- mechanical stress on heat exchanger and pipework.

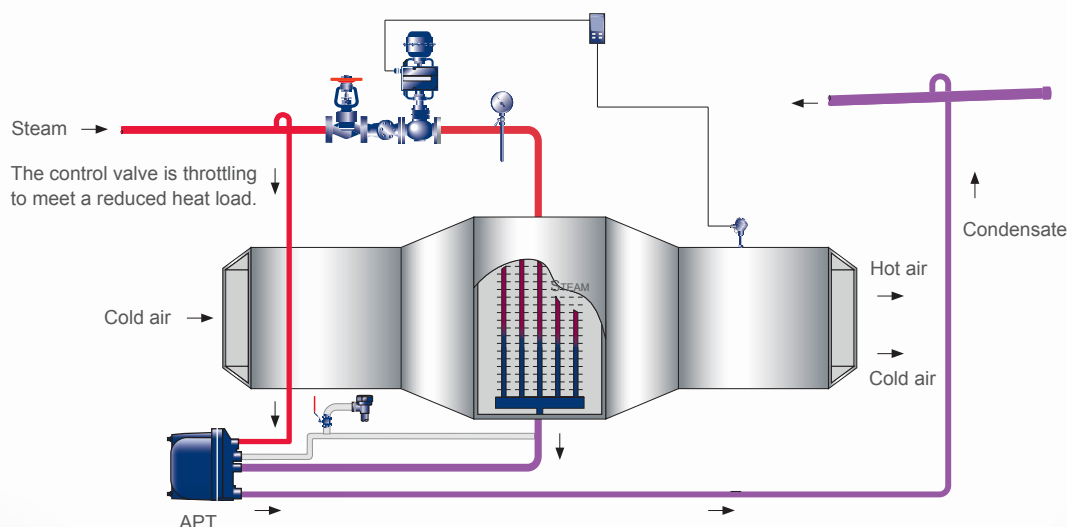
The ultimate effect of stall is increased maintenance and shorter service life of the heat exchanger and associated equipment. This increases overall running costs.



### Solution: an air heater battery with APT installed

By installing an APT into your application these issues will be eliminated. The APT automatically reacts when a rise in condensate is detected, ensuring the application can continue to operate efficiently and effectively:

- When the steam pressure is sufficient to overcome the total backpressure (including static lift) the pump function will be inactive. The trap will modulate to match the load and allow smooth condensate discharge.
- When the upstream steam pressure falls below the total backpressure, the pump will automatically detect a rise in condensate level and discharge the condensate utilizing the motive supply, thus preventing waterlogging of the steam space.



## Automatic pump trap features and benefits:

- **Compact design** - Which contains all the equipment needed to drain or remove condensate for all load conditions including vacuum (innovative patent applied for low profile mechanism).
- **Minimal installation space required** - The mechanism operates with as little as 8" installation head from the base of the pump.
- **Requires no electrical power** - Suitable for hazardous environments.
- **Fully automatic and self-regulating** - Only operates when needed. No sensors or controls required.
- **Packaged units are available** - Fully assembled, tested packaged units can be delivered to site ready for connection to your system.

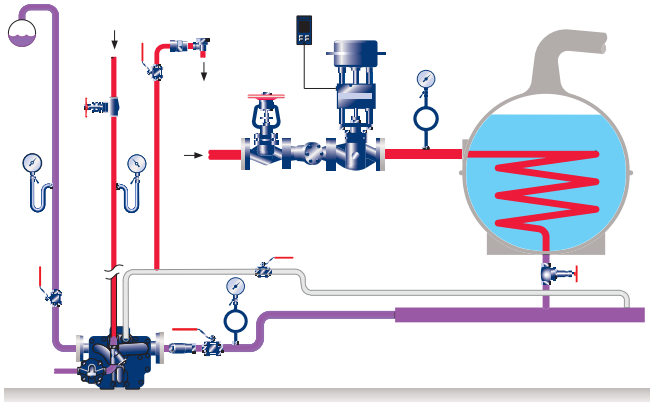


Material		SG Iron			Steel
Pump type		APT10-4.5	APT14	APT14HC	APT14SHC
Body design rating		PN10	PN16/ASME 150	PN16 / ASME 150	PN16 / ASME 150
Size	Inlet	Outlet			
	¾"	¾"	•		
	1½"	1"		•	
	2"	1½"			•
PMO Maximum operating pressure		65 psig	200 psig	200 psig	200 psig
TMO Maximum operating temperature		311°F	388°F	388°F	388°F
Maximum pump discharge/cycle		.55 gal	1.3 gal	2.1 gal	2.1 gal
Maximum trapping capacity (at 4.5 bar differential pressure)		2022 lb/hr	6614 lb/hr	15342 lb/hr	15342 lb/hr
Maximum pumping capacity (at 4.5 bar g motive pressure and 2.5 bar g backpressure)		1420 lb/hr	1367 lb/hr	2202 lb/hr	2202 lb/hr

Note: Pump capacities are only for comparison between pump models. Please refer to product specific technical information sheets (TI's) for the full capacities of each model.



## Automatic pump traps - Typical installation



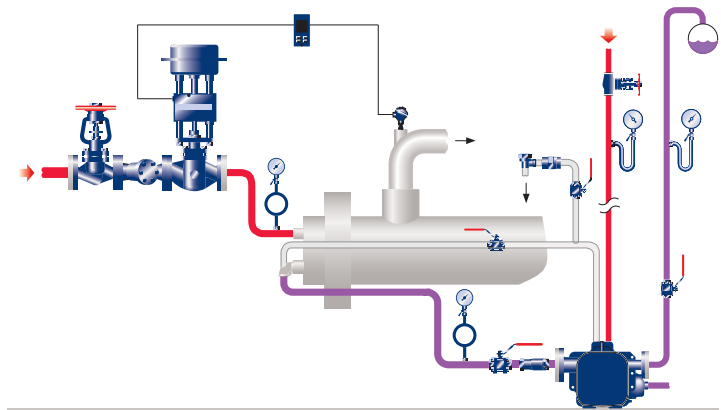
### Condensate removal from process vessels and heat exchangers

Designed for closed or sealed systems especially where space is limited. Removal of condensate under all pressure conditions ensures stable operating temperatures of the heat exchange interface. Tube corrosion, noise and waterhammer are all avoided - extending equipment life.

### Condensate removal from tube heat exchangers (closed system)

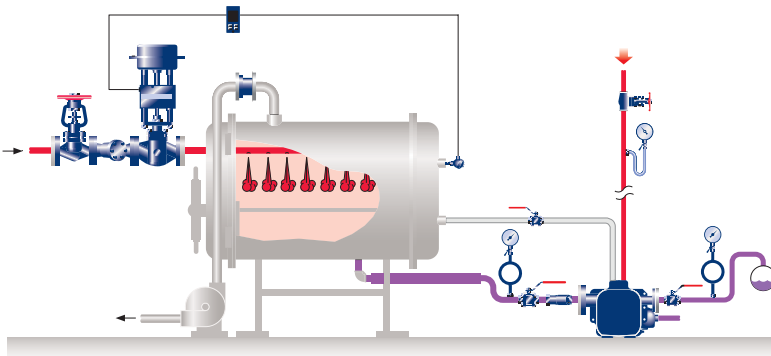
The APT is simply connected to the outlet of tube heat exchanger. Generally vacuum breakers are not required provided that equipment is suitably rated for operation under full vacuum conditions

The APT will drain condensate under all load conditions, giving exceptional temperature control at the heat exchange interface.



### Condensate removal from vacuum equipment (closed system)

Simple and efficient solution to a difficult problem. Without the need for high Net Positive Suction Head (NPSH), the APT will operate with only (0.2 m) installation head from the base of the pump, and remove condensate from a vacuum vessel, discharging it to either high or low level condensate return lines.



## Pump Packages

Our pump packages are made to fit directly into your system with minimal interruption to your process. As the package is pre-assembled, installation is fast and easy, ensuring you receive the benefits associated with efficient condensate removal sooner.

We provide pump packages in a range of sizes and connections, and we can help you select the most suitable unit for you application.

## Features and benefits of packaged pumping units

- Complete package, ready to use - Quick to install so shorter plant down-time.
- ANSI external connections - Convenient and flexible to install.
- All interconnecting ancillaries and pump monitor/counter included as standard - Guaranteeing system operation, peace of mind and easy installation with measurable performance.
- Modernized design, modular construction - Upgraded quality, functionality.
- Increased capacity - Standard solution for systems with large condensate return.



### Vented Pump Packages

Model	Pump Check Valve Size	Max flash Steam #/hr	Receiver	Condensate Inlet	Vent Line	Max Height	Max Width
Simplex PPEC	1"	375	8 gal	2" NPT	4" ANSI 150	44"	36"
	1½"						
Duplex PPEC	1"	375	8 gal	2" NPT	4" ANSI 150	51"	42"
	1½"	1,150	26 gal				
Simplex PTC	2"	1,150	26 gal	4" ANSI 150	6" ANSI	59"	42"
	3" x 2"						
Duplex PTC	2"	2,000	57 gal	4" ANSI 150	8" ANSI 150	64"	54"
	3" x 2"						
Simplex PTF	2"	1,475	31 gal	4" ANSI 150	6" ANSI 150	67.3"	46"
	3" x 2"						
Duplex PPF	2"	2,500	65 gal	4" ANSI 150	8" ANSI 150	71.4"	52"
	3" x 2"						

Note: Pump capacities are only for comparison between pump models. Please refer to product specific technical information sheets (TI's) for the full capacities of each model.

Closed Loop Packages				
Model	Inlet Outlet Connection	Connection Type	PMO	Max pumping capacity @ 50 psig motive to 25 psig back pressure with 5 psig in exchanger 8" fill head (#/hr)
APT 10 Simplex	3/4"	NPT	65 psig	350
APT 14 Simplex	1 1/2" X 1"	ANSI 150	200 psig	850
APT 14 Duplex	1 1/2" X 1"	ANSI 150		1700
APT14HC Simplex	2" X 1 1/2"	ANSI 150		1700
APT14HC Duplex	2" X 1 1/2"	ANSI 150		3400

Note: Pump capacities are only for comparison between pump models. Please refer to product specific technical information sheets (TI's) for the full capacities of each model.



## Flash Recovery Vessels

Flash steam is formed when hot condensate re-evaporates as it is discharged to a lower pressure. In this process, the flash steam separates from the water and is piped away from the top of the flash vessel. The remaining condensate drains from the bottom of the flash vessel through a steam trap. The flash steam is usually added to a low pressure steam system.

Model	Inlet & Vent Connection	Connection Type	Condensate Outlet Size	PMO and TMO	Max flash steam flow @ 0 psig operating (#/hr)	Height	Width
Size 6	6"	ANSI 150	1½"	150 psig and 500°F	270	47"	13"
Size 8	8"		2"		465	48"	14.6"
Size 12	12"		3"		1,060	49.5"	19.9"
Size 16	16"		3"		1,820	58"	23.5"

Note: Larger sizes and higher pressure units available. Consult Spirax Sarco, Inc.







## Electric Condensate Pumps

Electric condensate pumps are designed to be used in low pressure steam heating systems to collect and quickly return condensate to the boiler feed unit. The pumping action is controlled by the water level in the receiver. Multiple pump units can be used for greater pump capacity or to provide back-up pump protection, if required.

Boiler feed pumps are used to pump and precisely control the condensate and make-up water required by the boiler(s) in low pressure steam applications. The pumping action is controlled by the water level in the boiler.



## Features and benefits of electric condensate pumps

- **Designed for long-life** - Low maintenance and reliable service.
- **Available configurations** - Simplex, Duplex, Triplex or Quadruplex.
- **Large capacities** -Flow rates to 150 GPM.
- **Multiple receiver material** - Can be construed of close-grain cast iron or welded steel, rectangular or cylindrical configurations.
- **Various size receivers** - Can be provided in volume from 6 gallons to 1000 gallons.
- **True 2' NPSH units available** - Suitable for temperatures to 210°F.
- **Pumps are close-coupled to** - Heavy-duty, ball bearing open drip proof electric motors.

Type	Series	Material	Min Flow Rate (GPM)	Max Flow Rate (GPM)	Min Discharge Pressure	Motor Speed (RPM)	Max Receiver Size
Condensate Return	G	Cast Iron	18	18	40 psig	3500	45 gal
		Rectangular Welded Steel					
		Cylindrical Welded Steel					
	V	Cast Iron	1½	150	60 psig	1750 and 3500	110 gal
		Rectangular Welded Steel					110 gal
		Cylindrical Welded Steel					1000 gal
Boiler Feed	GB	Cylindrical Welded Steel	18	18	40 psig	3500	117 gal
	V	Cast Iron	1½	150	60 psig	1750 and 3500	110 gal
		Rectangular Welded Steel					110 gal
		Cylindrical Welded Steel					1000 gal



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