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PRIDE

QUALITY

CRAFTSMANSHIP

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Custom Design
TYPE CSC-B
Cylindrical **S**teel
Condensate Pumps
and
Custom Design
TYPE CSEC
Cylindrical **S**teel **E**levated
Condensate Pumps

SHIPCO® PUMPS are equipped with Mechanical Seals rated for temperatures up to 250°F as standard.
Higher temperature seals and special faces available upon request.

Type CSC-B or CSEC Condensate Units are available for larger volumes of condensate. Numerous sizes of receivers are available to permit flexibility and economical selections. These units may be customized to meet specific design requirements of a particular installation. Pumps are bronze-fitted with industry standard motors. Various pump models are available. A brief summary of different pump models is provided below.

These units may be customized to meet specific design requirements of a particular installation. The CSC-B (heightless of floor mounted saddles) design will handle condensate to 200°F with typical Model D pumps. By using the SHIPCO® Model P, the CSC-B design will handle up to 210°F. The CSEC (typically elevated 30") design will handle condensate to 212°F with Model P pumps.

Receivers are fabricated from 3/16" thick black steel, with flat heads. Standard features include: lifting eyes, inlet, drain, vent, overflow and pump suction connections. Optional heavier thicknesses of black steel receivers are available. In addition, the receivers may be epoxy lined, galvanized or Plasite #7156 lined. 300 series stainless steel receivers are also available for better corrosion resistance and longer life. As with most of our product line we will customize your receiver tappings for no additional charge.

Standard accessories for the Type CSC-B and CSEC condensate units are a dial thermometer, gauge glass assembly and a float control switch for each centrifugal pump. The elevated CSEC comes with suction piping, suction isolation valve and a valve in the pump bleed line as standard.

Optional accessories for the Type CSC-B and CSEC condensate units are manholes, mechanical alternators, Nema 4 or Nema 7 controls, high water float switches, inlet basket strainers, inlet cascade baffles, and on the CSC-B unit an all bronze butterfly isolation valve with valve in the bleed line.

Pumps can be Model D or Model P Style.

The **Model D** pump is the center of all SHIPCO® units. These pumps are bronze fitted and are designed with NPSH requirements in mind. Vertical mounting saves floor space and avoids dirt and water. Industry standard motors available in single or three phase, 1750 RPM or 3500 RPM. Vertical or horizontal style available. All units are equipped with mechanical seals rated for 250°F as standard. (Higher temperature seals and special faces available upon request.)

The **Model P** pump pumps high temperature condensate. This 2 ft. NPSH pump has mechanical seals rated for 250°F as standard. (Higher temperature seals and special faces available upon request.) Industry standard motors available in single or three phase, 3500 RPM. Vertical or horizontal styles available. This bronze fitted pump has an axial flow propeller to provide the necessary NPSH that high temperature water can not, thus assuring cavitation free operation. The P pump also contains straightening vanes to ensure that the water enters the suction cavity as smooth and straight as possible.

Electrical Control Panels are an integral option on the CSC-B and CSEC units. The panel can be factory mounted and wired to Nema and J.I.C. specifications for various duties. Our standard wiring allows for independent pump operation so you can remove a pump for maintenance and still operate the unit.

Magnetic Starters are required for all three phase motors. Our standard starter includes 3 leg overload protection. Single phase motors up to and including 1 HP have built-in thermal overload protection and do not require magnetic starters. Single phase motors larger than 1 HP usually do not have built-in thermal overload protection and require magnetic starters. Combination magnetic starter and disconnect options are available to meet code and servicing requirements.

Pump control and alternation

CSC units are designed to control the pumps by the level of the condensate in the receiver.

Standard units utilize 2 float switches to start and stop the pumps.

Option 1: Substitute 1 automatic mechanical alternator in place of the 2 float switches. The mechanical alternator will start and stop both pumps on a duplex unit. It will alternate the pumps on each duty cycle. In the event of extreme load conditions the alternator will also operate both pumps simultaneously for high level conditions.

Option 2: Utilizing the 2 standard float switches. Install 2 lead-off lag selector switches in the electrical control panel. These switches allow you to manually select the lead and lag pumps. The duty cycle can manually be reversed on a predetermined schedule for even wear.

Option 3: Utilizing the 2 standard float switches. Install an electrical alternator in the electrical control panel. The electric alternator will alternate the pumps on each duty cycle. In the event of extreme load conditions the second float switch will start the second pump. Both pumps will then operate simultaneously until the level recedes.

Recommended Receiver Sizes and Pump Capacities

The normal condensing rate of a steam heating system is .5 GPM per 1000 sq. ft. EDR. This rate may be slightly higher at start-up; however, by experience, sizing the flow rate of the condensate pump at twice the normal condensing rate delivers adequate capacity at start-up and efficient operation under normal loads. By using the Table of Heat and Power you can easily convert from one unit of measure to GPM.

Table — Values of Heat and Power

	GPM	BTU	Lbs/Hr	Sq. Ft. EDR
1 Boiler HP	.069	33,475	34.5	139.4
1,000 sq. ft. EDR	.50	240,000	247.3	1,000

Unit designation as follows:

RECEIVER/GALS.	UNIT TYPE	GPM	PSIG	MODEL PUMP

Example:

196	CSEC	150	30	P

196 GALLON RECEIVER,
ELEVATED WITH MODEL P PUMPS RATED 150 GPM @ 30 PSIG.

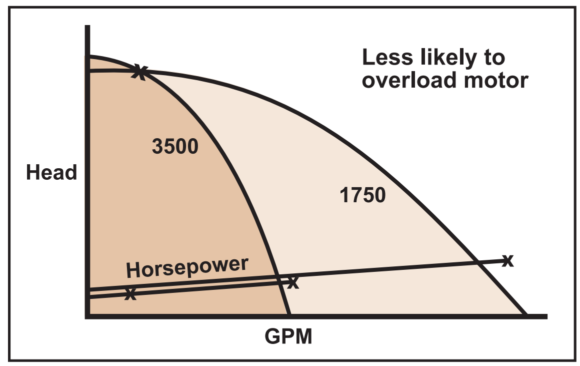
By knowing the flow rate of the condensate being produced from the system load, you calculate the pumping rate by multiplying it by 2.

ex: 30,000 lbs. per hr. x .002 GPM/lb. per hr. = 60 GPM. thus the pumping rate should be 60 GPM x 2 or 120 GPM.

Sizing the receiver: Condensate receivers are sized to collect and hold the return condensate for approximately 1 to 2 minutes. The pumps should run approximately 1 minute on each duty cycle. In our example the pump is sized for 120 GPM. Checking the receiver table for net storage capacity we would select a 24 x 60 receiver with 117 gallons of storage.

Why Are 3500 RPM Centrifugal Pumps Recommended for Most Boiler Feed and Surge Tank Applications?

1. More efficient than 1750 RPM for most condensate and boiler feed applications.
2. Operating and repair costs are lower because pumps are more efficient and the motors and parts are less expensive.
3. Less likely to overload motor than 1750 RPM pumps because of much steeper head—capacity, characteristic especially for small capacities (see diagram below). If actual head on the pump is lower than the design head, the pump will operate at higher capacities with accompanying higher power. The 3500 RPM pump maximum load is lower.



4. Just as durable as 1750 RPM centrifugal pumps for the same head and capacity. Centrifugal pumps are not subject to the wear problems of regenerative turbine pumps that are frequently chosen to run at 1750 RPM because of this inherent limitation.
5. NPSH requirements are low for the lower capacities and can be further reduced by use of a "propeller" (also referred to as an "inducer") for higher capacities where the NPSH available is unusually low.

Why Are Suction Strainers Not Recommended on Non-Turbine Centrifugal Pumps?

It is often asked whether a pump suction strainer is necessary or recommended. The purpose of a suction strainer is to act as a particulate strainer or filter ahead of the pump. This prevents large particles from entering the pump.

Before the introduction of the low-flow/high-head multi-stage centrifugal type pump, turbine type pumps were used almost exclusively for on/off boiler feed service for steam boilers. Back in the 1920s, a turbine pump was the only pump available for high-pressure pump applications since multi-stage, centrifugal pumps were not yet available. The turbine pump impeller was designed with very close tolerances within the pump. Any grit or sediment that entered the pump would result in accelerated erosion of these close-tolerance areas, leading to premature pump wear and loss of performance. These pump characteristics made the use of a strainer a necessity with a turbine type pump.

During the 1960s, ITT Domestic® and other manufacturers introduced multi-stage, centrifugal pumps into the high-pressure steam market. Then during the 1980s, manufacturers such as Grundfos, Gould, etc., started marketing multi-stage, centrifugal pumps and offering the pumps to boiler manufacturers who make feed tanks but not pumps. This strategy caused the boiler manufacturers to start specifying multi-stage, centrifugal pumps in lieu of turbines because the manufacturers now had a source for pumps.

Centrifugal pumps, by their design, are more durable. A centrifugal pump does not have the same close tolerances of a turbine pump—it has a more robust design that enables grit and sediment to pass through without clogging the impeller volute area. Therefore, the use of a suction strainer is neither mandatory nor recommended. Instead, an inlet basket on the return piping into the receiver and a wye strainer on the make-up water piping are recommended.

Below is a list of considerations regarding the use of suction strainers with centrifugal pumps:

- **Suction Losses:** The addition of a strainer in the suction line of a pump increases the losses in the suction line, thereby decreasing the NPSH available to the pump. As the strainer fills with particles, the pressure drop across the strainer increases, further reducing the NPSH available. This situation becomes more critical as the temperature of the pumped water increases. When a feed water pump is pumping from a deaerator, the water is already at the flash point, and any increase in the suction losses could lead to a flashing condition and pump cavitations.
- **Increased system maintenance:** Because of the reason stated above, it is important that the strainer screen be checked and cleaned regularly. If the installation is in a remote area and maintenance checks are rare, a clogged strainer will eventually lead to pump failure and a low water condition in the boiler.
- **Can particles get into the pump without a strainer?** SHIPCO® recommends use of inlet strainers on all deaerators and boiler feed tanks to help prevent particles from getting into the pump. In addition the suction piping typically extends 2" to 3" up into the receiver (often referred to as a vortex breaker). This extension helps prevent any sediment and large particles from leaving the tank through the suction opening. In SHIPCO® deaerators, the water entering the deaerator must travel through a series of spray valves, baffles, trays and other restricted flow paths before deaeration is complete and the water is ready for use. The number and size of the particles that will make it through this path and into the storage area is limited.

As the engineering community begins to better understand the functions of centrifugal and turbine pumps, the engineers are starting to remove requirements for suction strainers from specifications.

SHIPCO® believes that any *benefit of a suction strainer on centrifugal pumps is far outweighed by the risks*, which can lead to pump failures and other system problems.

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