SHIPPENSBURG PUMP CO. INC.
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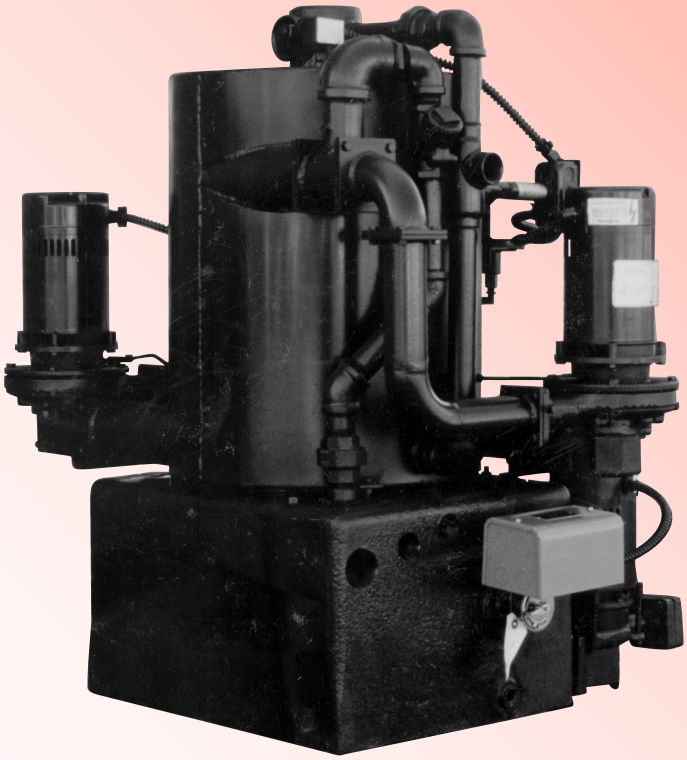
Pride

Quality

Craftsmanship



BULLETIN 129
Revised 6/18

TYPE BVMC

VACUUM AND MAKE-UP PUMPS WITH CAST IRON RECEIVERS

Capacities from 10,000 sq. ft. EDR to 50,000 sq.ft. EDR

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

SIZING VACUUM PUMPS

Vacuum pumps are normally sized based on a systems rating in sq. ft. EDR; for systems up to a nominal size of 10,000 sq. ft. EDR the vacuum design is normally .5 CFM per 1,000 sq. ft. EDR.

EXAMPLE: A 5,000 sq. ft. system would require what size vacuum pump?

.5 CFM/1000 sq. ft. EDR x 5000 sq. ft. EDR = .5 CFM x 5 = 2.5 CFM

For systems larger than 10,000 sq. ft. EDR the vacuum design is normally .3 CFM per 1,000 sq. ft. EDR.

EXAMPLE: A 20,000 sq. ft. system would require what size vacuum pump?

.3 CFM/1000 sq. ft. EDR x 20,000 sq. ft. EDR = .3 CFM x 20 = 6 CFM

The sizing recommended above should be used for well-maintained systems that are in good operating condition.

In systems where some leaks may be found or steam vacuum pumps are being replaced we recommend sizing the vacuum pumps at 1 CFM/1000 sq. ft. EDR and installing a full duplex system for double capacity.

NOTE: Where excessive leaks are prevalent and traps are not repaired it may be impossible to produce a vacuum until the system is repaired and tightened up.

Operating Range:

The normal operating range for the vacuum pumps is a range from 3" Hg to 8" Hg. SHIPCO®'s rating for its pumps is at 5½" Hg 160° F.

QUICK SELECTION TABLE — BASED ON EDR

SYSTEM CAPACITY SQ. FT. EDR	EQUIVALENT BOILER HP	FOR EA. VACUUM PUMP MULTIPLY CAPACITY x 2 RECOMMENDED CFM 5½ Hg @ 160°F FOR DUPLEX UNIT	MOTOR HP	RPM	CAST IRON RECEIVERS CAPACITY GALLONS	BOILER FEED PUMP CAPACITY GPM @ 2 TIMES EVAP. RATE*	INLET	DISCHARGE	MAKE-UP VALVE
10,000	71.7	5.8	¾	3500	57	10	3	1½	½
15,000	107.6	8	1	3500	80	15	4	1½	½
20,000	143.5	8	1	3500	125	20	4	1½	½
25,000	179.3	12	1½	3500	125	25	4	1½	¾
30,000	215.2	12	1½	3500	125	30	4	1½	¾
40,000	286.9	18	2	3500	260	40	4	1½	¾
50,000	358.7	18	2	3500	260	50	4	1½	1

*NOTE: Multiple Boiler applications may require multiple pumps sized for each boiler.

For other ratings consult factory for capacities.

SIZING BOILER FEED PUMPS

The evaporation rate of 1 boiler HP is .069 gallons per minute. The feed pump input rate is sized at a rate of 170% to 200% of the maximum steaming rate of the boiler. This method of sizing helps to balance the boiler conditions and reduce thermal shock to the boiler. Thermal shock is caused by oversizing the feed pumps. Oversizing feed pumps also tends to cause short cycling.

The boiler feed pump discharge pressure should be equal to the maximum boiler operating pressure, plus the increase in elevation, plus the friction loss of pipe, fittings, and valves, plus a safety margin (usually 5 to 10 PSI).

EXAMPLE: 500 HP Boiler operating at 15 PSI (max.), located 12 ft. above feed unit, pipe friction loss of 18 ft., feed valve with a 5 PSI differential loss.

500 HP x .069 GPM/HP = 34.5 GPM
evaporation rate x 200% = 69 gallons per minute pump capacity

Discharge pressure is 15 PSI operating pressure or 15 PSI x 2.31 ft./PSI = 34.65 ft., plus 12 ft. vertical rise, plus 18 ft. friction loss, plus 5 PSI x 2.31 ft./PSI = 11.55 ft. (valve loss).

34.65 ft. + 12 ft. + 18 ft. + 11.55 ft. = 76.2 ft. Total

76.2 ÷ 2.31 = 33 PSI, plus a safety margin of 5 PSI = **38 PSI**

Selecting a pump from the table for 70 GPM at a discharge pressure of 40 PSI or a 3 HP — 127 pump.

WATER PUMP CAPACITIES

NOTE: Table below shows capacities from up to 10" Hg Model D Pumps

FT. TDH	PSIG	MAXIMUM CAPACITIES AT MOTOR HP (3500 RPM) and APPLICABLE DISCHARGE PRESSURE								
103.95	45					15 117	30 117	45 117	112-1/2 114	GPM Pump Type
80.85	35				15 116	30 116	45 117	60 127	112-1/2 114	GPM Pump Type
69.3	30				18 116	30 116	45 117	75 114	112-1/2 114	GPM Pump Type
57.75	25			22-1/2 116	30 116	45 116		112-1/2 114		GPM Pump Type
46.2	20		18 110	30 116	37-1/2 116	45 116	60 113	112-1/2 114		GPM Pump Type
34.65	15	18 110	22-1/2 110	30 110	37-1/2 116	45 116	60 113	112-1/2 114		GPM Pump Type
23.1	10	22-1/2 110	30 110		45 116		112-1/2 114			GPM Pump Type
MOTOR HP		1/3	1/2	3/4	1	1-1/2	2	3	5	

QUICK SELECTION TABLE – VACUUM PUMP

Air Capacity for single units rated in CFM

	HG. 5-1/2" @ 160°F	HG. 10" @ 70°F	HG. 15" @ 70°F	MOTOR HP	MOTOR RPM
	6	5.8	3.5	3/4	3500
C	6	5.8	3.5	3/4	3500
F	8.5	8.5	5.5	1	3500
M	8.5	8.5	5.5	1	3500
	12	12	9	1-1/2	3500
	18	18	16	2	3500
Cubic	18	18	16	2	1750
Feet	32	32	20	3	3500
Per	32	32	23	3	1750
Min.	52	52	42	5	3500
	52	52	44	5	1750
	74	74	62	7-1/2	1750
	103	103	85	10	1750

RECEIVER SIZING — BVMC UNITS

The receivers in this series of units are sized to allow for approximately a 10-minute system lag time. The lag time of the system is the time from which the steam, evaporated at the boiler, travels to the radiation device, condenses to water and returns to the boiler. This is adequate for most systems.

Boiler required make-up water is added to the receiver on BVMC Units. This helps, by tempering the make-up water, to reduce thermal shock to the boiler.

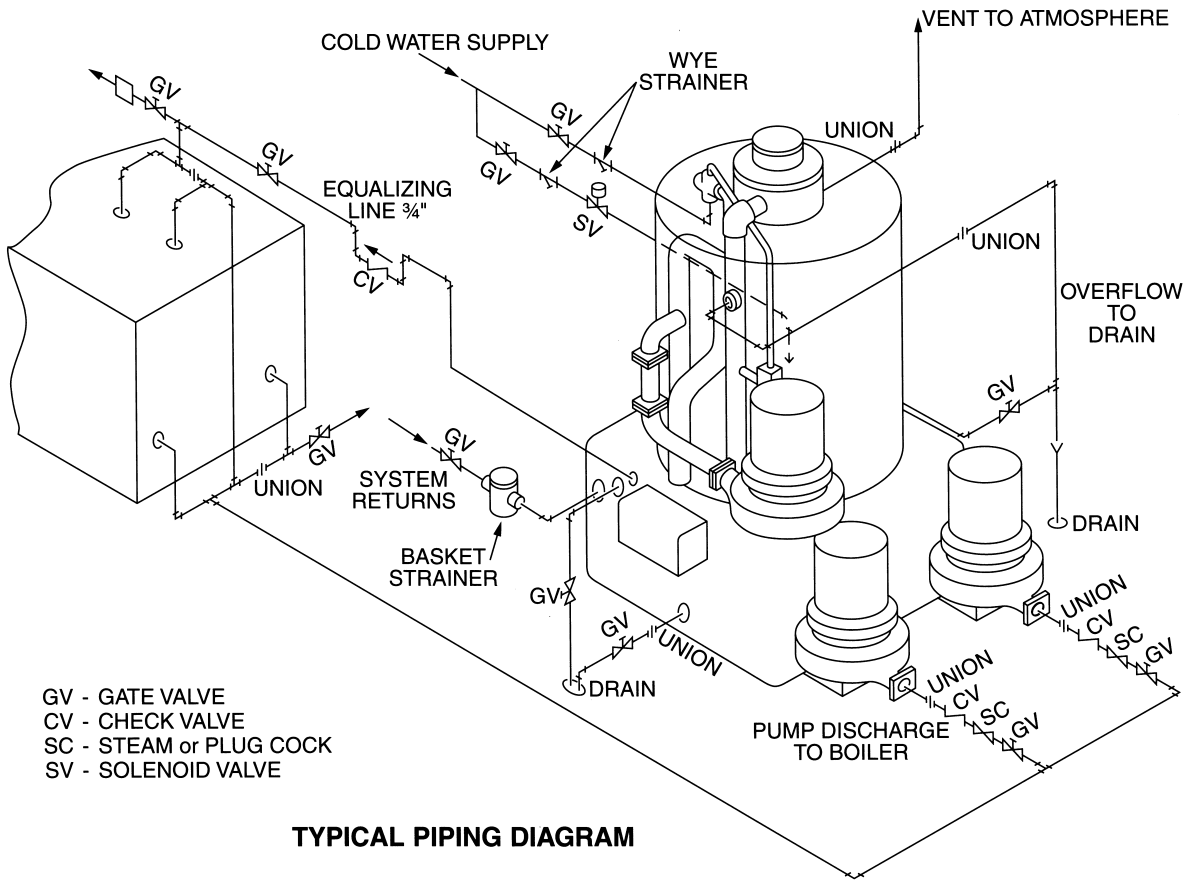
CAST IRON	
25 Gallons	125 Gallons
37 Gallons	160 Gallons
57 Gallons	260 Gallons
80 Gallons	500 Gallons

TYPICAL: DESCRIPTION OF OPERATION

SHIPCO® PUMPS **Type BVMC Unit** is typically furnished to feed one or more boilers. The more common installation is for multiple boilers and multiple pumps. Typical piping of the boiler feed pumps along with typical wiring diagrams are shown in the piping and controls section for boiler feed pumps.

The standard BVMC unit is furnished with a solenoid make-up valve controlled by a float switch in the boiler feed receiver. This automatically provides make-up water to the boilers, should it be required. A low water cut-off switch is furnished to prevent the pumps from operating should the make-up system fail and prevent the pumps from running dry, burning the mechanical seals. An optional temperature limit switch may be installed in the boiler feed receiver to shut off the vacuum pumps should the water temperature reach temperatures that would cause it to boil under vacuum. Audible and visual alarms may also be connected to indicate a high temperature condition. Should the boiler feed receiver flood, an unloading float switch in the boiler feed receiver will start the vacuum pumps, and the air suction pipe (from the vacuum producer) will then function as a mechanical lift pipe.

The water above the pre-selected high water level is then lifted by vacuum into the vacuum hurling receiver to be discharged out the overflow to drain. An alternate method of handling a high water condition in the boiler feed receiver is to install an unloading pump on the boiler feed receiver. The unloading pump is actuated by the high water float switch and pumps the excess water to the drain.



TYPICAL PIPING DIAGRAM

SHIPCO® PUMPS Type BVMC Combination Vacuum and Boiler Feed Units are designed to provide an efficient, quiet, dependable and constant system vacuum, while providing adequate storage for the system lag time and providing water to the boiler on demand.

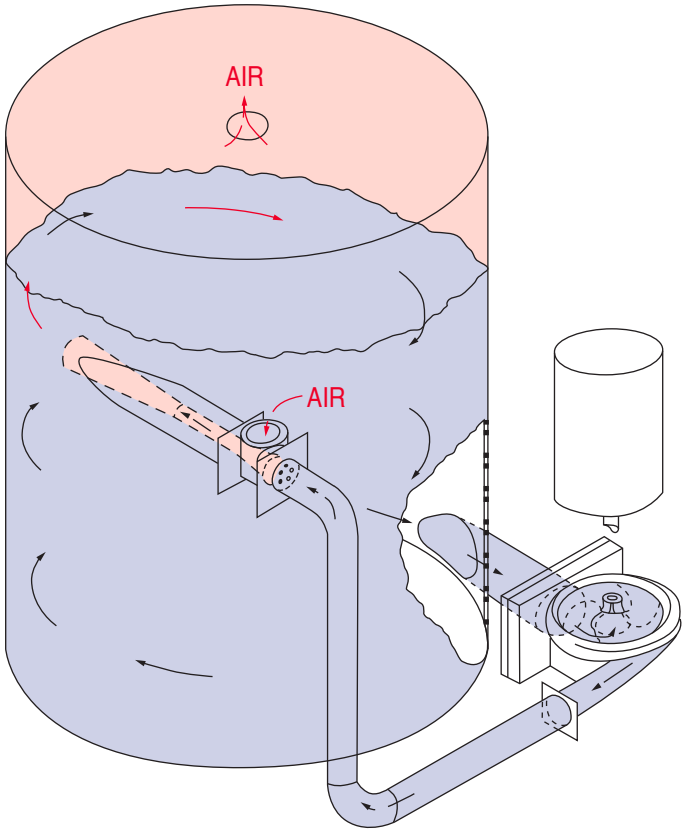
The multi-jet vacuum producer is a simple but reliable means for producing a constant system vacuum. The centrifugal pump, in conjunction with the multi-jet nozzle and venturi, is not only able to produce a vacuum but can also handle large volumes of vapors when compared to other types of vacuum producers.

Our illustration shows the integral parts and design configuration of the SHIPCO® vacuum producer. The vacuum chamber requires a cold water connection to the automatic make-up valve. This assures a constant level of water in the vacuum producer for optimum performance.

Water is pumped from the circular chamber to the nozzle by the centrifugal pump.

High velocity water going through the multiple nozzle entrains air at the vacuum and compresses it in the ejector.

It then reenters the circular chamber where the air (red arrows) is separated from the water (black arrows) which recirculates to the pump.



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