especially with widely fluctuating loads as the efficiencies of centrifugal boiler feed pumps drop off very rapidly for the smaller sizes of pumps and for low load conditions. For this reason centrifugal pumps are not usually employed for installations of less than 1000 b.hp.

For small capacities screw pumps may be successfully used for greater economy.

CONDENSATION RETURN PUMPS

Condensation return pumps are generally of two classes:

1. Automatic pumps and receivers.
2. Continuous operation non-automatic return pumps.

AUTOMATIC PUMPS AND RECEIVERS

The volumetric capacities of receivers should be from 2 to 5 times the maximum minute volumetric flow of condensation to be handled, measured between the high and low water lines in the receivers for electric driven pumps and much smaller for steam driven pumps.

The piston speeds in feet per minute should not be more than 10 times the square root of the number of inches in the length of stroke.

The volumetric displacement rate of water pistons should be 3 or more times the maximum volumetric rate of the flow of condensate to be handled.

The normal capacities for centrifugal pumps should be 2 or more times the maximum rate of flow of the condensation to be handled.

CONTINUOUS OPERATION NON-AUTOMATIC RETURN PUMP

The volumetric displacement rate of water pistons should be not less than 2 times the maximum rate of flow of the condensation to be handled.

Piston speeds in feet per minute should not be more than 10 times the square root of the number of inches in the length of stroke.

The quantities of condensate to be handled from direct radiation, direct-indirect radiation and indirect or fan blast radiation can be estimated as follows:

The normal capacity of pumps should be based on condensate at a temperature of not over 180 deg. fahr. For temperature of condensate above 180 deg. fahr. capacity should be increased above that estimated for 180 deg. fahr. condensate as per Table 58.

TABLE 58. TEMPERATURE OF CONDENSATE AT PUMP SUCTION

Deg. fahr.	Factor
190	1.15
200	1.56
204	2.00

TABLE 59. CENTRIFUGAL RETURN PUMPS WITH RECEIVERS

Size of Pump Discharge Inches	Receiver Capacity Gallons	Sq. Ft. Direct Radiation	Lbs. Condensate per Hour	H. P. to Drive	Total Head Ft.
1	40	12,000	4000	1	25
1½	60	25,500	8500	1½	50
2	100	42,000	14,000	2	50

TABLE 60. CHARACTERISTICS OF CENTRIFUGAL PUMPS AND RECEIVERS DELIVERING AGAINST 15 LB.

Size	Sq. Ft. Equivalent Direct Radiation	Gal. per Min.	R. P. M.	Actual H. P.	H. P. Motor Supplied	Floor Space	Shipping Weight
101	8000	11	1725	0.4	¾	5′ 3″x3′ 8″	700
102	16,000	22	1725	0.6	¾	5′ 3″x3′ 8″	700
103	26,000	35	1725	0.8	1	6′ 5″x3′ 8″	750
104	40,000	60	1140	1.0	1½	7′ 6″x4′ 2″	1050
105	65,000	90	1140	1.4	2	7′ 6″x4′ 2″	1100

TABLE 61. SIZES, SPEEDS, HORSE-POWERS AND CAPACITIES ELECTRIC MOTOR DRIVEN CONDENSATION RETURN PUMPS

Rating in Sq. Ft.	0 to 2000		2000–4000		4000–8000		8000–16000	
Discharge Pressure, Lb.	10	20	10	20	10	20	10	20
Gallons per Min.	3	3	6	6	10	10	20	20
H. P. Motor	⅜	¾	⅜	¾	⅜	¾	⅜	¾
R. P. M. 60 Cycle and D. C.	1700	1700	1700	1700	1700	1700	1700	1700
R. P. M. 25 Cycle	1440	1440	1440	1440	1440	1440	1440	1440
Shipping Weight	330	350	350	370	420	440	535	565

TABLE 62. MOTOR DRIVEN CONDENSATION PUMP CAPACITIES FOR DELIVERING AGAINST VARIOUS PRESSURES

Radiation in Sq. Ft. of Direct Radiation	Minimum Gallons per Min.	Maximum Boiler Pressure Lb.	Motor H. P.	Suggested Size of Piping Inches	Radiation in Sq. Ft. of Direct Radiation	Minimum Gallons per Min.	Maximum Boiler Pressure Lb.	Motor H. P.	Suggested Size of Piping Inches
4000	6–8	10	¼	1	15,000	25–30	10	¾	2
4000	6–8	15–40	½	1	15,000	25–30	15	1	2
4000	6–8	50–60	¾	1	15,000	25–30	20–30	1½	2
					15,000	25–30	40	2	2
					15,000	25–30	50–60	3	2
6000	9–12	10	¼	1¼	20,000	30–40	10	¾	2
6000	9–12	15–40	¾	1¼	20,000	30–40	15	1	2
6000	9–12	50–60	1	1¼	20,000	30–40	20	2	2
					20,000	30–40	30–40	3	2
					20,000	30–40	50–60	5	2
8000	12–16	10	½	1¼	25,000	40–50	10	1	2½
8000	12–16	15	¾	1¼	25,000	40–50	15	1½	2½
8000	12–16	20	1	1¼	25,000	40–50	20	2	2½
8000	12–16	30–60	1½	1¼	25,000	40–50	30–40	3	2½
					25,000	40–50	50–60	5	2½
10,000	15–20	10	½	1½	30,000	50–60	10	1	2½
10,000	15–20	15	¾	1½	30,000	50–60	15	1½	2½
10,000	15–20	20–30	1	1½	30,000	50–60	20	2	2½
10,000	15–20	30–40	1½	1½	30,000	50–60	30–60	5	2½
10,000	15–20	50–60	2	1½					