THE AERCO KC COMMERCIAL LAUNDRY HOT WATER SYSTEM

The AERCO KC system recommended for commercial/industrial laundries (i.e. hospital or hotel laundries) is illustrated in Figure 1. Because laundries are subjected to periodic surge flows, supplementary storage is usually required keep the maximum load on a gas-fired water heater within the heater's maximum capacity.

PRINCIPLE OF OPERATION

BTUs are stored in a stratified storage tank on a constant temperature-variable volume (of hot water) basis, i.e., the system depends on an absolute minimum of mixing of cold water and hot water in the tank. The discharge to the system is taken from the top of the tank and/or the heater. The supply of hot water in the upper portion of the tank is replenished at a constant rate by the heater operating as its maximum usage period.

Sizing and selection of the components is covered in the following explanation and example. System set-up and adjustment consists simply of setting the system final outlet temperature and adjusting one balancing cock to set the circulating pump to operate at the correct point on its curve.

DETERMINATION OF LAUNDRY HOT WATER REQUIREMENTS: AVERAGE HOURLY HOT WATER RATE (AHHWR)

Commercial laundry equipment generally uses two (2) gallons or less of 180°F water per pound of clothes or linens washed. This figure is recommended by most machine manufacturers. Most "heavy" work requires a nominal 1 hour was cycle, inclusive of loading and unloading the machine, and is based on a 50-60 second fill time. The use of the shorter 30 second fill time will shorten the total cycle only 3 to 4 minutes.

The shorter cycles more commonly used now are not shorter because of shorter fill time, but, instead, are achieved by the elimination of a suds or rinse cycle or both. These are generally employed with synthetic fabrics which also use lower water temperatures. Thus, the figure of 2 gallons/pound of fabrics being washed can be considered to be 2 gallons/pound of machine capacity for determination of the Average Hourly Hot Water Rate (AHHWR).

If a 30 second fill cycle is standard for the entire laundry operation, this figure might be increased 6% to 7% to 2.14 gallons/pound of machine capacity. However, the figures used here are conservative enough to preclude this necessity.

Average Hourly Hot Water Rate = (2) x (total machine capacity in pounds)

SIZING THE KC SERIES GAS-FIRED HEATER

$$\textit{Heater capacity (recovery rate) in GPM} = \frac{\textit{AHHWR}}{\textit{60 mins.}} = \frac{\textit{2GPH x total machine capacity in pounds}}{\textit{60 mins.}}$$

(see Chart A for heater selection)

SIZING THE STRATIFIED STORAGE TANK

Approximately 2/3 of the water usage in the normal laundry machine cycle occurs in a 20 minute period (1/3) hour. During this period, the heater can make only half of this required amount or 1/3 of the hourly requirement.

The stratified storage tank must provide the other half or 1/3 of a full hour requirement. Stratification within the tank precludes 100% usability. Standard practice has shown that the tank is able to deliver between 60% and 80% of its total capacity without excessive temperature degradation. AERCO recommends using 70% of the total capacity of an unbaffled vertical tank piped as shown in Figure 1.

Storage Tank size in gallons = 2GPH x machine capacity in pounds
3 x 0.7

SIZING THE CIRCULATOR

Select the required pump flow rate from Chart B below, based on desired system set point and number of KC units selected. Head loss depends on loop piping.

CHART A-Heater Selection (in GPM)

	1 KC1000	*2 KC 1000*	*3 KC 1000*
40-140	***18***	***36***	***54***
40-160	***15***	***30***	***45***
40-180	***13***	***26***	***39***

CHART B-Circulator Selection (in GPM)

	1 KC1000	*2 KC 1000*	*3 KC 1000*
40-140	***18***	***36***	***54***
40-160	***15***	***30***	***45***
40-180	***13***	***26***	***39***

If recovery rate required is less than or equal to capacities shown above, select that number of KC water heaters.

EXAMPLE: Given washer capacities of:
and a required temperature rise of 40° - 160° F,

	1 400#
	1 200#
	1 100#
	1 75#
TOTAL	775#

AHHWR = (2) x (775#) = 1550
Heater Capacity = 2 x (775)/60 = 26 gpm; from chart A: 2 KC 1000s
Tank Capacity = 2 x (775) / (3 x 0.7) = 738 gallons[1]
Circulatory Capacity = 30 GPM, from chart B

DETERMINATION OF MAXIMUM INSTANTANEOUS DEMAND (MID)

The nominal machine cycle of 45 to 50 minutes exclusive of loading and unloading is generally based on a 50 to 60 second time to fill to high fill level. Many machine manufacturers are currently recommending a 30-second time to fill to high fill level. While fill time has no impact on tank and circular sizes, and none on heater capacity, it does impact line sizes and dictates the maximum surge flow through the tank nozzles which must be accommodated. Therefore, it is essential to be able to determine this flow for various "fill" times.

The factors used in the following examples are machine manufacturer's recommended factors to account for diversity resulting from a varying number of machines and variations in machine sizes.

2 minute fill time

1 or 2 machines:
MID = 0.15 GPM x capacity of largest machine in pounds
3 or more machines:
MID = 0.15 GPM x capacity of largest machine in pounds PLUS
0.10 GPM x total capacity of all other machines in pounds

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corrected; was *"738 gallons divided by 0.7 = 1050 gallons"* 10/8/93

1-minute fill time

1 or 2 machines:
MID = 0.3 GPM x capacity of largest machine in pounds
3 or more machines:
MID = 0.3 GPM x capacity of largest machine in pounds PLUS
0.15 GPM x total capacity of all the other machines in pounds

30-second fill time

1 or 2 machines:
MID = 0.60 GPM x capacity of largest machine in pounds
3 or more machines:
MID = 0.60 GPM x capacity of largest machine in pounds PLUS
0.25 GPM x total capacity of all the other machines in pounds

SELECTING TANK NOZZLES AND PIPE SIZES

Using the calculated MID, select tank nozzle and pipe sizes from Chart C. Choose tank water inlet and outlet connections to keep velocities below 2 fps (feet per second). Choose pipe sizes to velocities below 7 fps. Note on Figure 1 that the piping between the tank and heater(s) does not see the MID, only the pumped flow rate. Therefore, this piping only needs to be selected for the pumped flow rate.

ALTERNATE SIZING: DESIGNING FOR NO SUPPLEMENT

In a small laundry (up to 200 pound total machine capacity, and where fill times of 1 minute or longer are acceptable), it is practical to consider the use of the AERCO KC1000 heater without any supplemental storage.

Heater capacity is the selected equal to the maximum instantaneous demands (MID) as calculated for the standard system above.

EXAMPLE (Alternate Sizing):

A small laundry with incoming water at 40°F in winter and water to machines at 160°F, has the following laundry machines:

1 with 75 pound capacity
1 with 50 pound capacity
125 pounds = Total Capacity

Heater Capacity

MID for largest machine = 75 pounds x 0.30 GPM = 22.5 GPM
MID for all other machines = 50 pounds x 0.15 GPM = 7.5 GPM
Total MID = 30 GPM

From Chart A, heater selection is: (2) KC1000 heaters

Chart C — Velocity of water in FPS (feet per second) in schedule 40 pipe for water at 60° F

GPM	2"	2-1/2"	3"	3-1/2"	4"	5"	6"	8"
6	0.574							
8	0.765							
10	0.956	0.67						
15	1.43	1.01						
20	1.91	1.34	0.868					
25	2.39	1.68	1.09	0.812				
30	2.87	2.01	1.30	0.974				
35	3.35	2.35	1.52	1.14	0.882			
40	3.83	2.68	1.74	1.30	1.01			
45	4.30	3.02	1.95	1.46	1.13			
50	4.78	3.35	2.17	1.62	1.26			
60	5.74	4.02	2.60	1.95	1.51			
70	6.70	4.69	3.04	2.27	1.76	1.12		
80	7.65	5.36	3.47	2.60	2.02	1.28		
90	8.60	6.03	3.91	2.92	2.27	1.44		
100	9.56	6.70	4.34	3.25	2.52	1.60	1.11	
125	11.97	8.38	5.43	4.06	3.15	2.01	1.39	
150	14.36	10.05	6.51	4.87	3.78	2.41	1.67	
175	16.75	11.73	7.60	5.68	4.41	2.81	1.94	
200	19.14	13.42	8.68	6.49	5.04	3.21	2.22	
225		15.09	9.77	7.30	5.67	3.61	2.50	1.44
250			10.85	8.12	6.30	4.01	2.78	1.60
275			11.94	8.93	6.93	4.41	3.05	1.76
300			13.00	9.74	7.56	4.81	3.33	1.92
325			14.12	10.53	8.19	5.21	3.61	2.08
350				11.36	8.82	5.62	3.89	2.24
375				12.17	9.45	6.02	4.16	2.40
400				12.98	10.08	6.42	4.44	2.56
425				13.80	10.71	6.82	4.72	2.73
450				14.61	11.34	7.22	5.00	2.89
475					11.97	7.62	5.27	3.04
500					12.60	8.02	5.55	3.21
550					13.85	8.82	6.11	3.53
600					15.12	9.63	6.66	3.85
650						10.43	7.22	4.17
700						11.23	7.78	4.49
750						12.03	8.33	4.81
800						12.83	8.88	5.13
850						13.64	9.44	5.45
900						14.44	9.99	5.77

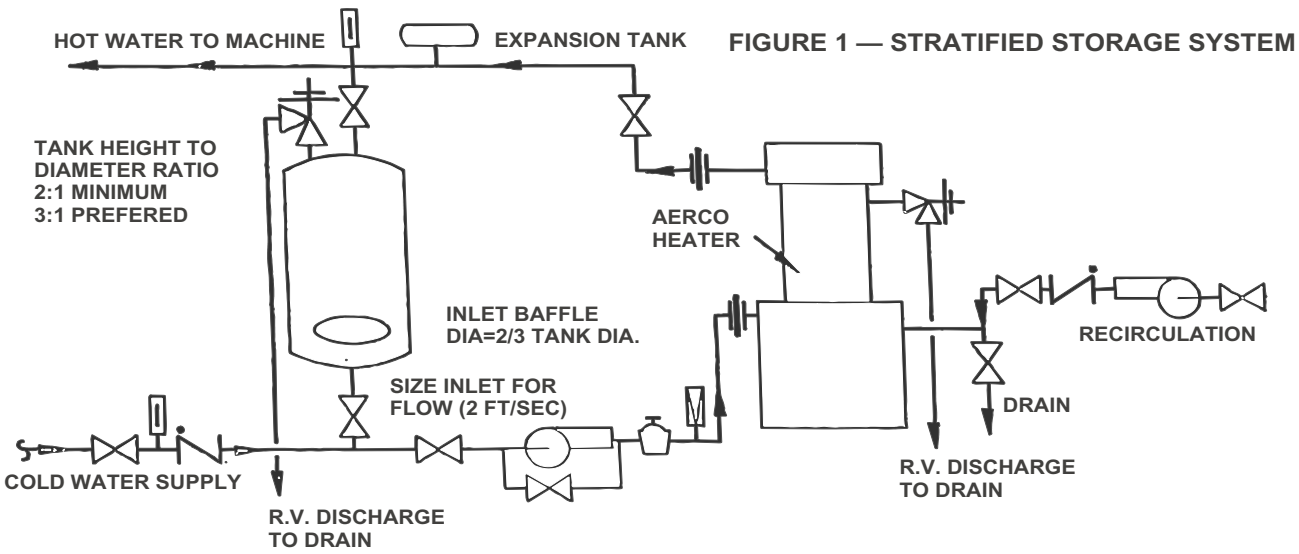

FIGURE 1 — STRATIFIED STORAGE SYSTEM

	STOP VALVE		THERMOMETER		CIRCULATOR		
	RELIEF VALVE		CHECK VALVE		FLOW METER		CIRCUIT SETTER

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