

Aqua Saver

Closed-loop
clean water
cooling system

Closed-loop eliminates
water loss by evaporation and
algae & bacteria problems.



BRINGING YOU THE FINEST FROM PIONEER AIR SYSTEMS

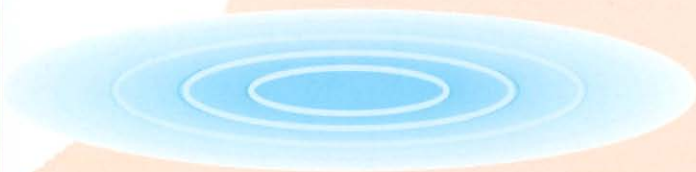
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Aqua Saver

Closed-loop

clean water

cooling system



Enjoy these Benefits

Reduce water usage by over 95% with an Aqua Saver system with Trim Cooler.

Eliminate algae and bacteria-type problems.

No water consumption.

Eliminate sewer charges.

Adaptable to heat recovery.

Eliminate scale and corrosion.

Extend equipment life.

Reduce maintenance cost.

Reduce down time.

Easy installation.

Provide cooler water with Trim Cooler.



Energy Saving Control Panel

Standard in ASP series and optional in AS series heat exchangers. Includes power-on/off switch, power-on indicator, fan motor starter(s), and fan cycling thermostat(s). Fan cycling saves energy and provides temperature control under varying load and ambient conditions.

*included with your
Aqua Saver
Packaged system
(ASP series)...*

- ① *Aqua Saver heat exchanger*
- ② *Fan cycling*
- ③ *Simplex or Duplex pumping station*
- ④ *Trim Cooler with water regulating valve*
- ⑤ *All prewired and prepiped
on a single skid*



TEN-YEAR
limited warranty



Ten-year prorated heat exchanger and pump warranty is standard in ASP series.

For one year from the date of purchase, Pioneer Air Systems, Inc. will replace or repair, or provide free of charge any part or parts found to be defective in material or workmanship. One-year mechanical parts only warranty applies to equipment outside the mainland USA, Canada and Mexico.

The customer shall contact the factory to obtain warranty service authorization prior to performing any service.

Manufacturer is not responsible for incidental, consequential, shipping and handling charges.

*Extended warranty
available.
Free freight...
mainland U.S.A.*

Air-cooled heat exchanger data

MODEL	3CAPACITY x 1000		FANS (HP)	WATER IN/OUT	DIMENSIONS-INS MM				4FLUID CAPACITY		5APPROX. SHPG./OPER. WT			
	BTU/HR	K.CAL/HR			OAW	OAD	OAH	GALS	LITERS	LBS.	KGS			
AS48H ¹	48	12.1	1(1/2)	1"MPT	32	813	36	915	41	1,042	22	83	165	75
AS78H	78	19.7	1(1/2)	1"MPT	37	940	36	915	46	1,169	23	87	188	86
AS102H	102	25.7	1(1/2)	1"MPT	37	940	36	915	46	1,169	25	95	204	93
AS156H	156	39.3	2(1/2)	1 1/2"MPT	69	1,774	36	915	46	1,169	28	106	303	138
AS205H	205	51.7	2(1/2)	1 1/2"MPT	69	1,774	36	915	46	1,169	30	114	328	149
AS236H	236	59.5	2(1/2)	1 1/2"MPT	69	1,774	36	915	46	1,169	32	121	352	160
AS343V ²	343	86.4	2(1)	1 1/2"MPT	84	2,134	64	1,626	46	1,169	41	155	649	295
AS449V	449	113.1	2(1)	2"MPT	84	2,134	64	1,626	46	1,169	53	201	709	322
AS522V	522	131.5	2(1 1/2)	2"MPT	84	2,134	64	1,626	49	1,226	55	208	791	359
AS674V	674	169.5	2(1 1/2)	2 1/2"MPT	84	2,134	64	1,626	49	1,226	70	265	972	441
AS783V	783	197.3	3(1 1/2)	2 1/2"MPT	120	3,054	64	1,626	49	1,226	74	280	1,062	482
AS898V	898	226.3	3(1 1/2)	2 1/2"MPT	120	3,054	64	1,626	49	1,226	78	295	1,243	564
AS965V	965	243.2	3(1 1/2)	2 1/2"MPT	120	3,054	64	1,626	49	1,226	80	303	1,284	583
AS1044V	1,044	263.1	3(1 1/2)	2 1/2"MPT	120	3,054	64	1,626	49	1,226	85	322	1,365	620
AS1100V	1,100	277.2	4(1 1/2)	2 1/2"MPT	114	2,883	89	2,261	49	1,226	90	341	1,420	645
AS1347V	1,347	339.4	4(1 1/2)	3"MPT	114	2,883	89	2,261	49	1,226	100	379	1,746	792
AS1448V	1,448	364.9	6(1)	3"MPT	165	4,179	89	2,261	49	1,226	105	398	1,809	821
AS1566V	1,566	394.6	6(1)	3"MPT	165	4,179	89	2,261	49	1,226	110	416	1,929	875
AS1796V	1,796	452.6	6(1)	4"FLG	165	4,179	89	2,261	49	1,226	125	473	2,266	1,028
AS1931V	1,931	486.6	6(1)	4"FLG	165	4,179	89	2,261	49	1,226	130	492	2,349	1,066
AS2088V	2,088	526.2	6(1)	4"FLG	165	4,179	89	2,261	49	1,226	140	530	2,510	1,139
AS2200V	2,200	554.4	8(1)	4"FLG	216	5,474	89	2,261	49	1,226	145	549	2,620	1,189
AS2500V	2,500	630.0	8(1)	4"FLG	216	5,474	89	2,261	49	1,226	150	568	2,751	1,248
AS2846V	2,846	717.2	10(1 1/2)	4"FLG	267	6,770	89	2,261	49	1,226	155	587	3,124	1,418
AS2975V	2,975	749.7	10(1 1/2)	4"FLG	267	6,770	89	2,261	49	1,226	160	606	3,256	1,477
AS3271V	3,271	824.3	12(1 1/2)	4"FLG	318	8,077	89	2,261	49	1,226	165	625	3,506	1,591
AS3608V	3,608	909.2	12(1 1/2)	6"FLG	318	8,077	89	2,261	49	1,226	170	645	3,781	1,716
AS3910V	3,910	985.3	12(1 1/2)	6"FLG	318	8,077	89	2,261	49	1,226	175	663	3,931	1,784

NOTES:

- "H" = Horizontal air discharge-standard; vertical-optional.
- "V" = Vertical air discharge-standard; horizontal-optional.
- Approximate capacity @ 90-95°F ambient, 115°F outlet temperature and 140°F inlet temperature.
- Includes simplex pump, expansion tank and 100 ft. length of in/out size piping. Add 6% for duplex pump.

Table 1

Kleen-Water Filters data

MODEL	PORT SIZE NPT-IN	MAX. PRESS. PSIG	MAX GPM	MAX TEMP. °F	DIMENSIONS INCHES				APPROX. SHIPPING WT. (LBS)	TYPE
					A	B	C	D		
KW25	1	300	25	225	16 1/4	4 1/2	-	1 1/4	15	T
KW50	1 1/2	300	50	225	20 3/4	5 1/4	-	1 1/4	20	T
KW100	2 1/2	300	100	225	27 1/4	6 1/4	-	1 1/4	35	T
KW150	3	300	150	225	37 1/4	6 1/4	-	1 1/4	56	T
KW200	3	300	200	225	38 3/4	7 1/4	-	2 1/4	58	T
KW250	3	300	250	225	44 1/4	7 1/4	-	2 1/4	70	T
KW300	4 FLG.	225	300	225	72	21 1/4	57	15	450	F
KW450	6 FLG.	225	450	225	85	20 3/4	68	15	500	F

NOTES:

- Filters come with initial element(s).
- To order spare element, add 'E' before filter Model Number.
- Larger sizes built to specifications.

OPTIONS:

- Flange Connections, where not standard.
- Pressure Differential Lights/Contacts.
- Multi-Filter Assemblies with By-Pass valving.

Table 2

Aqua Saver packaged systems

MODEL	INCLUDES...
ASP48H	AS48H, KF100, SP033
ASP78H	AS78H, KF100, SP033
ASP102H	AS102H, KF100, SP050
ASP156H	AS156H, KF150, SP075
ASP205H	AS205H, KF200, SP075
ASP236H	AS236H, KF250, SP075
ASP343V	AS343V, KF300, SP100
ASP449V	AS449V, KF400, SP150
ASP522V	AS522V, KF500, SP200
ASP674V	AS674V, KF650, SP300
ASP783V	AS783V, KF800, SP300
ASP898V	AS898V, KF800, SP300
ASP965V	AS965V, KF1000, SP500
ASP1044V	AS1044V, KF1000, SP500
ASP1100V	AS1100V, KF1000, SP500
ASP1347V	AS1347V, KF1250, SP500
ASP1448V	AS1448V, KF1600, SP750
ASP1566V	AS1566V, KF1600, SP750
ASP1796V	AS1796V, KF2000, SP750
ASP1931V	AS1931V, KF2000, SP750
ASP2088V	AS2088V, KF2000, SP750
ASP2200V	AS2200V, KF2500, SP750
ASP2500V	AS2500V, KF3000, SP750
ASP2846V	AS2846V, KF3000, SP750
ASP2975V	AS2975V, KF3000, SP1500
ASP3271V	AS3271V, KF3000, SP1500
ASP3608V	AS3608V, KF3000, SP2000
ASP3910V	AS3910V, KF3000, SP2000

Table 3

Kleen-Water Filters... recommended

For longevity and dependability, we recommend Kleen-Water Filters which are 99.0% efficient down to 1 micron. For point of installation see Figure 3.

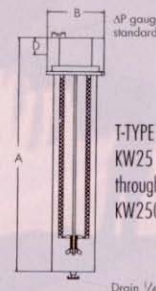


Figure 1.

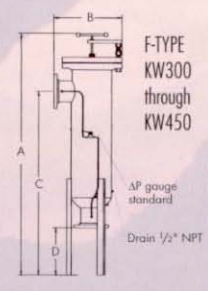


Figure 2.

AquaSaver

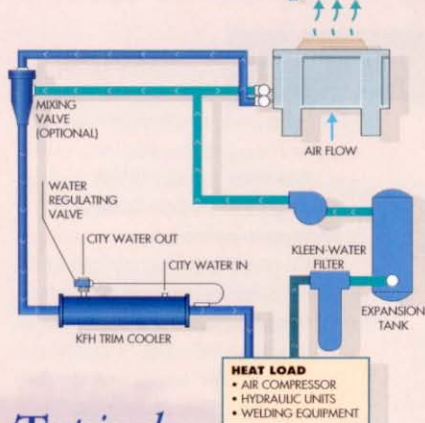


Figure 3

Typical Aqua Saver installation

HEAT LOAD
 • AIR COMPRESSOR
 • HYDRAULIC UNITS
 • WELDING EQUIPMENT

Options

1. Packaged Aqua Saver systems.
2. Freeze-Protector heat transfer fluid.
3. Fan cycling.
4. High temperature indicator and/or alarm.
5. Pump failure indicator and/or alarm.
6. Pump auto start (duplex pump only).
7. NEMA 4x, J.I.C., NEMA 7, NEMA 4 or NEMA 12.
8. TEFC motors, fan(s) and pump(s).
9. Trim cooler and water regulating valve.
10. Automatic fill.
11. Three-way mixing valve for temperature control.
12. No-flow shut down.
13. Expansion tank sight glass.
14. Low level shut down and indicator.
15. Larger expansion tanks.
16. Optional gauges.
17. Pressure relief valve.

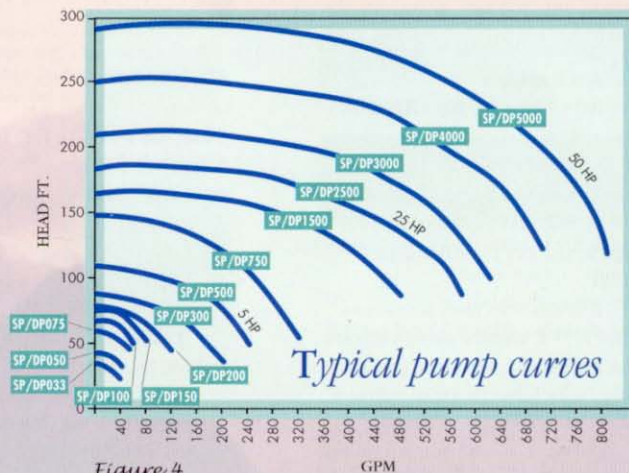


Figure 4

Pumping stations

Simplex

Includes a pump, starter, NEMA 1 control panel, power-on light, on/off switch, and a water-out pressure gauge; prepped, prewired and mounted on a heavy skid.

Duplex... greater reliability

Includes two pumps, two check valves (one for each pump), starters, NEMA 1 control panel, power-on light, on/off switch, water-out pressure gauge and water-out temperature gauge. Additionally, each pump is piped with two isolation valves. Either of the pumps can be replaced without disturbing the other. All components are prepped, prewired and mounted on a heavy skid.

Simplex and Duplex pumping stations data

MODEL	DIMENSIONS						EXPANS. TANK	WATER IN/OUT	APPROX. SHGP. WT.						
	SP-DP-	HP	SIMPLEX (SP)		DUPLEX (DP)				GAL	LIT	SIMPLEX		DUPLEX		
		WIDTH IN	DEPTH IN	HEIGHT MM	WIDTH IN	DEPTH IN			NPT IN	LBS	KGS	LBS	KGS		
033	1/8	30	28	38	30	28	38	762 x 711 x 965	12	45	1 1/4	330	123	620	231
050	1/4	30	28	38	30	28	38	762 x 711 x 965	12	45	1 1/2	380	142	720	269
075	3/8	30	28	38	30	28	38	762 x 711 x 965	12	45	1 1/2	415	155	780	291
100	1	40	37	48	40	37	48	1016 x 940 x 1219	30	114	1 1/2	575	215	975	364
150	1 1/2	40	37	48	40	37	48	1016 x 940 x 1219	30	114	2	600	224	1070	399
200	2	40	37	48	40	37	48	1016 x 940 x 1219	30	114	2	675	252	1170	436
300	3	40	37	54	40	42	54	1016 x 940 x 1372	80	303	2	895	334	1490	556
500	5	40	37	54	40	42	54	1016 x 940 x 1372	80	303	2 1/2	995	371	1590	593
750	7 1/2	40	37	54	40	42	54	1016 x 940 x 1372	80	303	3	1190	444	1690	630
1000	10	60	37	54	60	48	54	1524 x 940 x 1372	120	455	4 FLG.	1290	481	2090	780
1500	15	60	37	54	60	48	54	1524 x 940 x 1372	120	455	4 FLG.	1395	520	2395	893
2000	20	60	37	54	60	48	54	1524 x 940 x 1372	120	455	6 FLG.	1595	595	2590	966
2500	25	72	37	90	72	48	90	1828 x 940 x 2286	240	910	6 FLG.	1995	744	3090	1153
3000	30	72	37	90	72	48	90	1828 x 940 x 2286	240	910	6 FLG.	2095	781	3290	1227
4000	40	72	37	90	72	48	90	1828 x 940 x 2286	240	910	6 FLG.	2295	856	3590	1339
5000	50	72	37	90	72	48	90	1828 x 940 x 2286	240	910	8 FLG.	2395	893	3890	1451

NOTES:

- Standard voltages: 115-1-60 or 230-1-60 for SP/DP033 through SP/DP075; 230-3-60 or 460-3-60 for SP/DP100 and up. Nonstandard voltages available.
- The Aqua Saver heat exchanger shall be oversized by 10–20%, and the pumping system shall be oversized by 25–50%.

Table 4

Sizing example

Size an Aqua Saver and Trim Cooler to cool a 100 HP rotary screw compressor with an after-cooler for the following conditions:

1. Maximum ambient temperature: 95°F/35°C
2. Minimum ambient temperature: 0°F/-18°C
3. Water temperature required: 95°F/35°C or lower
4. City water available @ 70°F/21°C
5. Heat load (Q) = 100 x 2550 = 255,000 BTUH

A screw compressor may run into motor service factor at peak loads, therefore we shall plan a cooling system with a capacity of 1.15 x 255,000 = 293,250 BTUH.

The Aqua Saver alone will not cool water to 95°F when the ambient temperature reaches 95°F, so we shall include a Trim Cooler to provide partial cooling at peak temperatures.

Let us assume the system is adjusted to 20 GPM flow at 95°F to compressor. At peak ambient temperature, the Aqua Saver may cool water from 125°F to 102°F and the Trim Cooler further cools it to 95°F. At these conditions, the Aqua Saver will remove 20 x 500 x 23 = 230,000 BTUH and the Trim Cooler will remove 63,250 BTUH. Since the objective is to minimize



Figure 4

cooling water usage by the Trim Cooler, we will size the Aqua Saver for 10–15°F approach temperature (0.7 correction factor—table 7).

The Aqua Saver shall have a minimum capacity of 230,000 ÷ 0.7 = 328,571 BTUH.

We recommend AS343V.

Now, we will size the Trim Cooler to handle 63,250 BTUH:

- Small ΔT (S) ÷ Large ΔT (L) = 5 ÷ 25 = 0.2
From Table 6, P = 0.5
- LMTD = P x Large ΔT = 0.5 x 25 = 12.5
- Required surface area (A) = Q ÷ (U x LMTD), where (U) is the heat transfer coefficient (table 13). For water to water, (U) = 400. Therefore, (A) = 63,250 ÷ (400 x 12.5) = 12.65 sq. ft.

Pioneer Model KF300 is recommended (table 8).

Conclusion: Recommended Aqua Saver Packaged system ASP343V

The system includes AS343V heat exchanger, KF300 Trim Cooler and SP100 pumping system.

Notes:

1. The actual temperatures and flows may vary.
2. The city water usage is for a very short time when the ambient temperature may be over 85°F.
3. A typical Aqua Saver system with Trim Cooler reduces water usage by over 95%.

Approach temperature correction factors

APPROACH TEMP.	CORRECTION FACTOR
25°F	1.00
20°F	0.85
15°F	0.70
10°F	0.50

Table 7

Trim Cooler selection

MODEL	SURFACE AREA
KFH50	2.5
KFH100	4.6
KFH150	6.9
KFH200	9.2
KFH250	11.5
KFH300	13.8
KFH400	18.1
KFH500	23.0
KFH650	29.9
KFH800	36.8
KFH1000	46.0
KFH1250	57.5
KFH1600	73.6
KFH2000	92.0
KFH2500	115.0
KFH3000	138.0

Table 8

Mixing valve selection (optional)

To provide freeze protection under extreme conditions, the valve capacities with a 5 PSIG pressure drop are:

PIPE SIZE	GPM	PIPE SIZE	GPM
½" NPT	15.0	2" NPT	100.0
¾" NPT	21.0	2½" FLG	180.0
1" NPT	23.0	3" FLG	200.0
1¼" NPT	43.0	4" FLG	400.0
1½" NPT	85.0		

Table 5

'P' Factors for values S ÷ L

S/L	P	S/L	P
0.10	0.39	0.60	0.78
0.15	0.45	0.65	0.81
0.20	0.5	0.70	0.84
0.25	0.54	0.75	0.87
0.30	0.58	0.80	0.90
0.35	0.62	0.85	0.92
0.40	0.66	0.90	0.95
0.45	0.69	0.95	0.98
0.50	0.72	1.0	1.0
0.55	0.75		

Table 6

Freeze-Protector

The chemically inhibited fluid is designed to provide freeze, burst and corrosion protection as well as efficient heat transfer. The fluid is fluorescent pink providing easy leak detection.

The special corrosion inhibitor in the fluid coats the metal surfaces to prevent acid formation from normal oxidation. This reduces maintenance costs and extends the life of process equipment. Freeze-Protector is available in 55-gallon and 5-gallon drums.

Installation

1. Clean system properly.
2. Mix with good quality water. Distilled water is recommended.

Selection for air compressors

SYSTEM COMPONENT SELECTION (TYPICAL)						*COMPRESSORS W/AFTERCOOLER	
AQUA SAVER HEAT EXCHANGER MODEL NO.	PUMPING SYSTEM SP/DP	TRIM COOLER KFH-	WATER REG. VALVE INS MM	MIXING VALVE INS MM	MAX B.H.P. @95°F (MAX) AMBIENT	MAX B.H.P. @105°F (MAX) AMBIENT	
AS48H	033	100	1/2 10	1/2 12	20	15	
AS78H	033	100	1/2 10	1/2 12	30	25	
AS102H	050	100	1/2 10	1/2 12	35	30	
AS156H	075	150	1/2 10	1/2 20	46	35	
AS205H	075	200	1/2 12	1/2 20	58	46	
AS236H	075	250	1/2 12	1 25	69	58	
AS343V	100	300	1/2 20	1 25	115	87	
AS449V	150	400	1/2 20	1 1/2 30	145	115	
AS522V	200	500	1 25	1 1/2 30	173	144	
AS674V	300	650	1 25	1 1/2 30	230	175	
AS783V	300	800	1 1/2 30	1 1/2 40	250	200	
AS898V	300	800	1 1/2 30	1 1/2 40	288	230	
AS965V	500	1000	1 1/2 40	2 50	300	250	
AS1044V	500	1000	1 1/2 40	2 50	345	288	
AS1100V	500	1250	1 1/2 40	2 50	375	300	
AS1347V	500	1250	2 50	2 50	460	345	
AS1448V	750	1600	2 1/2 60	2 1/2 60	490	375	
AS1566V	750	1600	2 1/2 60	2 1/2 60	518	400	
AS1796V	750	2000	2 1/2 60	2 1/2 60	575	450	
AS1931V	750	2000	2 1/2 60	2 1/2 60	650	500	
AS2088V	750	2000	2 1/2 60	2 1/2 60	690	550	
AS2200V	750	2500	2 1/2 60	3 75	800	650	
AS2500V	750	3000	2 1/2 60	3 75	900	750	
AS2846V	750	3000	2 1/2 60	3 75	950	800	
AS2975V	1500	3000	2 1/2 60	3 75	1050	850	

* For compressors without After Coolers multiply B.H.P. above by:

TYPE	COMP. W/A.C.	1-STAGE	2-STAGE	ROTARY
BTUH/BHP	2550	900	1560	2000
MULTIPLY BHP BY	1.0	2.83	1.63	1.27

Table 9

Freezing & boiling pts. aqueous solutions

FREEZING TEMP. °F	% FREEZE- PROTECTOR (WT)	BOILING TEMP. °F
26	10	214
18	20	216
7	30	220
-8	40	222
-29	50	225
-55	60	230
<-60	70	242

Caution:

1. Freeze-Protector shall not be used where the fluid may inadvertently come in contact with potable water, food and other consumables. Consult factory for these applications.
2. Use copper or stainless steel piping only.

Table 10

Maximum recommended flow

PIPE SIZE	GPM @20-50 PSIG	PIPE SIZE	GPM @20-50 PSIG
0.5"	8	2.5"	120
0.75"	14	3.0"	180
1.0"	23	4.0"	300
1.25"	36	5.0"	450
1.5"	50	6.0"	600
2.0"	78	8.0"	1200

For 100 ft. or less equivalent pipe length (after allowing for fittings). Oversize for longer lengths.

Table 11

Heat load (Q)

FLUID	FORMULA
Water	$Q = 500 \times \text{GPM} \times \Delta T \times \text{specific heat}$ (sp. heat for water = 1.0)
Oil	$Q = 210 \times \text{GPM} \times \Delta T \times \text{specific heat}$
50% Freeze Prot.	$Q = 450 \times \text{GPM} \times \Delta T \times \text{specific heat}$

Table 12

Typical heat transfer coefficients (U)

TUBE SIDE FLUID	WATER	50% FREEZE OIL PROTECTOR
Water	400	100 350
Oil	50	
50% Freeze Protector		90 300

Table 13

Conversion data

1 PSI =	2.036 in. of mercury = 2.31 ft. of water = 0.069 bar = 0.070 KG/cm ² = 6895 Pascal
1 Cu. Ft. =	7.48 U.S. gallons = 0.0283 cu. meter = 28.32 liter = 29.92 quarts = 59.84 pints = 6.233 imp. gallons
1 lb. =	0.4536 KG
1 HP =	746 watts = 2547 BTUH = 33,000 ft. lbs./min. = 10.68 k. calories/min.
°F =	32 + (1.8 x °C)
1 BTU raises	1 lb. of water 1°F.
1 BTU raises	54 cu. ft. of air 1°F (std. press. & temp.)
1 lb. of steam	raises 1 gal. of water approx. 100°F.

Table 14

Specifications

The packaged, single-skid, closed-loop system shall include...

A. Air-cooled Heat Exchanger

High-efficiency heat exchangers shall cool larger water flows with minimum pressure drop by using atmospheric air as the cooling medium. The cooling capacity to HP ration shall be maximum.

- Multi-circuit design shall have minimum pressure drop.
- Coil design shall allow even air distribution and therefore minimum pressure drop.
- For longevity materials shall be:

Coil: aluminum fins, copper tubes

Legs: galvanized steel

Housing: aluminum

Motors shall be direct-drive, amply sized to handle designed load conditions.

Specially designed heavy-gauge aluminum-blade fans shall be statically and dynamically balanced for vibration-free operation. Fans shall be protected with coated safety guards. Number of fans shall be _____, each _____ H.P. Fans shall cycle to save energy and provide temperature control.

All connections shall be factory wired to the junction box on the housing exterior or to the control panel.

The heat exchanger shall be Pioneer model _____

B. Simplex Pumping Station

Unit shall include a pump, expansion tank, starter, NEMA 1 control panel, power-on light, on/off switch, water-out pressure gauge, and water-out temperature gauge.

The pumping station shall be Pioneer model _____

C. Trim Cooler

The Trim Cooler shall be tube and shell design. Tubes, shell and baffles shall be of rust-free materials: copper and/or brass.

The trim cooler shall be Pioneer model _____

Options:

- Duplex Pumping Station (in lieu of Simplex)
Unit shall include two pumps, an expansion tank, two check valves (one for each pump), starters, NEMA 1 control panel, power-on light, on/off switch, water-out pressure gauge and water-out temperature gauge. Additionally, each pump shall be piped with two isolation valves, one on the suction side and one on the discharge side, so that either of the pumps can be removed from the piping system and replaced without having to shut down the system. All components shall be prepped, wired and mounted on a skid.

The Duplex Pumping Station shall be

Pioneer model _____

- Freeze Protector heat transfer fluid, _____ gallons.
- NEMA 4 electrical
- TEFC motors, fan(s)
- TEFC motors, pump(s)
- Water filter, Pioneer model _____
- _____
- _____
- _____

AquaSaver

Closed-loop

clean water

cooling system



Your Representative...

Contact your local distributor or call Pioneer toll-free to receive information on Pioneer's Innovative Quality Systems:

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Mr. Goodaire refrigerant dryers
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* Provided by Pioneer Engineering, Inc.

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