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Alternate Energy Systems, Inc.

A Corporation devoted to Energy-Oriented Needs

UPDATE October 2014

ProCool™-50 / ProCool™-30 Heat Transfer Solution for AES Water Bath Vaporizers

General Information

Water Bath Vaporizers use - as the name implies - water as the heat transfer medium. However, since the heat exchanger components and the bath box of the WB-series are manufactured from carbon steel, it is recommended that the heat transfer solution be a mixture of water and an industrial coolant/heat transfer fluid with inhibitors to provide rust/corrosion protection.

Under no circumstances should an automotive grade coolant be used as the heat transfer fluid. Using standard automotive coolant could cause premature deterioration of the heat exchangers and other vaporizer components.

It is also recommended that the water in the heat transfer solutions be de-ionized. While it is acceptable to use small amounts of standard tap-water to replenish any water that might have evaporated, it is not recommended to use standard tap-water for the initial charge of the water bath. If at all possible, topping-off should be done with pre-diluted solutions of corrosion-inhibited heat transfer solution at the required system concentration (see water specifications below).

Heat Transfer Solution recommended by Alternate Energy Systems

Industrial-grade heat transfer solutions are usually Ethylene-Glycol or Propylene-Glycol based. Both types have comparable heat transfer capabilities, almost identical freeze protection, and, if used with inhibitors, can provide excellent corrosion protection.

Propylene-Glycol based heat transfer fluids, while slightly more expensive than Ethylene-Glycol based solutions, are by far more environmentally friendly, and are therefore the only heat transfer solutions recommended by Alternate Energy Systems.

Alternate Energy Systems recommends a 50/50 Propylene-Glycol/DI-Water solution for installations in all locations without extreme ambient temperatures. This mixture will provide burst protection to -60°F (-50°C), and will provide freeze protection to -30°F (-34°C), while providing a maximum of corrosion protection. Specially formulated ProCool™ heat transfer fluid is available for installations with extremely low or extremely high ambient temperatures.

In cooperation with a leading manufacturer of corrosion-inhibited Propylene-Glycol, Alternate Energy Systems offers ProCool™ heat transfer fluid for all WB-series Water Bath Vaporizers.

We are stocking ProCool™-100 heat transfer fluid (undiluted), and ProCool™-50 (pre-mixed 50/50 with DI-Water), in 55-gallon drums and in 275-gallon totes, and can ship the quantities needed for the initial charge on the same truck as the vaporizer at no, or very minimal, additional shipping charges.

If required, we can also provide a small utility pump, complete with suction hose and discharge hose, for the transfer of the ProCool™ heat transfer fluid from the drums or totes to the vaporizer.

10-Year Warranty for Heat Exchangers

Alternate Energy Systems extends a limited 10-year warranty for heat exchangers to all customers who purchase ProCool™ heat transfer solution for the initial charge of the vaporizer bath

and who can document that recommended maintenance procedures, including periodic testing and, if required, re-inhibiting, have been followed.

ProCool™ Heat Transfer Fluid

ProCool™ heat transfer fluid is an inhibited propylene glycol based industrial heat transfer agent. It is a slightly hazy liquid, free of suspended solids with only a slight odor.

Since ProCool™ heat transfer fluid is formulated with propylene glycol, it is especially suitable for applications in which toxicological and environmental considerations are critical.

ProCool™ heat transfer fluid is compatible and completely interchangeable with systems currently utilizing ethylene glycol based heat transfer agents.

ProCool™ heat transfer fluid protects heat exchanger systems from freezing in winter, overheating in summer, and corrosion in all seasons.

Improved heat transfer and less internal corrosion contributes significantly to lower overall operating and maintenance costs.

ProCool™ heat transfer fluid is recommended as a heat transfer fluid for vaporizers. The corrosion protection provided by ProCool™ heat transfer fluid and its low toxicity level as compared to other heat transfer fluids makes it an ideal transfer medium.

Water Specifications

The use of hard water should be avoided. Hard water contains calcium and magnesium ions which deposit scale in the system and could also cause precipitation of a portion of the inhibitor system. When hard water conditions exist, distilled, deionized, or boiler condensate water should be used.

To avoid the introduction of water with questionable quality, Alternate Energy Systems recommends to use only pre-diluted ProCool™ heat transfer fluid, and to top off with deionized/distilled Water.

Component	Specification
Chloride	25 ppm max.
Sulfate	25 ppm max.
Calcium	25 ppm max.
Magnesium	25 ppm max.
Total Hardness	100 ppm max.

Heat Transfer Solution Maintenance

Alternate Energy Systems, through an independent laboratory, provides a comprehensive system maintenance program, including a product analysis service to assure that the heat transfer solution maintains the proper inhibitor level and desired freeze protection.

Once the system is in operation, it is recommended that samples of solution be taken at least once a year. The solution should be circulated for 30 minutes prior to sampling to ensure a representative sample.

Sample Test Kits

Sample test kits are available upon request from Alternate Energy Systems free of charge to customers who purchase ProCool™ heat transfer fluid products.

The kits include: self-addressed shipping box; pre-labeled sample container; weather-proof self-adhesive product installation tag; and detailed sampling procedures.

Analytical results from the samples will be forwarded by the laboratory directly to our customers.

Reinhibiting Procedure

Occasionally, after prolonged or severe service, a solution of ProCool™ heat transfer fluid may need to be reinhibited. The need for reinhibition will be detected during the periodic analysis program and a recommended procedure will be included with the analytical results.

ProCool™ heat transfer fluid supplemental coolant additives (SCA) are available in five gallon and 55-gallon drum quantities from Alternate Energy Systems.

The components of ProCool™ SCA replenish critical inhibitors that are required to provide continued protection. Additives used in inhibiting ProCool™ heat transfer fluid coolant should be handled in strict accordance with instructions that are included with the shipment.

Availability

ProCool™ heat transfer fluid is only available from Alternate Energy Systems, Inc.

We stock ProCool™ heat transfer fluid in 55-gal drums and in 275-gal totes, and can ship the quantities needed for the initial charge on the same truck as the vaporizer at no, or very minimal, additional shipping charges.

If required, we can also provide a small utility pump, complete with suction hose and discharge hose, for the transfer of the ProCool™ heat transfer fluid from the drums or totes to the vaporizer.

HTS-5055	55-gal drum ProCool™-50
HTS-5275	275-gal drum ProCool™-50
HTS-3055	55-gal drum ProCool™-30
HTS-3275	275-gal drum ProCool™-30

Handling and Storage

ProCool™ heat transfer fluid may be stored in unlined carbon steel tanks and drums. If storage of concentrated ProCool™ heat transfer fluid for periods over 12 months is desired, it is recommended that the storage vessels be constructed from aluminum, stainless steel, or lined carbon steel. Vinyl, epoxy, and phenolic linings are suitable. Amercoat®-23 and Amercoat®-75 linings have been found to be satisfactory.

ProCool™ heat transfer fluid in undiluted form will not freeze at ambient temperatures. Freezing will not harm ProCool™ heat transfer fluid, but when the temperature of undiluted ProCool™ heat transfer fluid is below 30°F, the viscosity will be such that pumping and transfer will be difficult. In areas where these conditions exist, it is recommended that storage vessels be equipped with stainless steel heating coils.

Diluted ProCool™ heat transfer fluid is easily pumped under normally expected temperatures. However, at temperatures below -20°F, special pumping equipment may be necessary.

The normal precautions associated with any chemical should be observed in handling ProCool™ heat transfer fluid. This product is neither explosive nor flammable under normal storage conditions. The propylene glycol in this product is considered practically nontoxic. Splashes onto eyes or skin however, must be washed away quickly and medical treatment is advised for eye exposure. Breathing of the vapors or mists should be avoided. Consult the available MSDS for details.

Typical Properties of ProCool™		Test Method
Specific Gravity at 60°F/15°C	1.055	D-1122
Reserve Alkalinity, ml	12.0	D-1121
pH of 33% Solution	10.0	D-1287
Foaming Tendency, Volume in ml Break Time in sec.	150 30	D-1881
Freeze Point °F / °C	-30 / -34	D-1177
Water in Concentrate, Weight %	4.0	D-1123
Color	clear / light yellow	
Appearance	slightly hazy and free of suspended solids	
Ash in Concentrate, Weight %	2.0	D-1119
Density in lb/gal / kg/gal at 60°F / 15°C	8.8 / 2.0	D-1122
Flash Point, COC, °F / °C	225 / 107	D-92
Boiling Point, 50% vol. Solution, °F / °C	222 / 106	D-1120
Solubility in Water	complete	

Toxicity and Safety

ProCool™ heat transfer fluid is not considered hazardous under ordinary conditions of handling and use. Propylene glycol, which is the main component of this product, is considered practically nontoxic.

ProCool™ heat transfer fluid is only minimally irritating to skin and eyes, but as with any chemical, unnecessary contact with these body parts is to be avoided. Consult the available MSDS for details.

Recommended Temperature Range

-45 °C to +120°C -50°F to 250°F

Properties of ProCool™

A comprehensive list of all thermo-physical properties of ProCool™ can be found on the next page. For health and safety information, or to request a Material Safety Data Sheet, download the MSDS from our web site.

Composition: Propylene glycol, inhibitors
 Appearance: Clear, light yellow
 Odor: Little or none

Required Concentrations of ProCool™ for Burst Protection:

Temperature		Volume % ProCool™ for Burst Protection
°C	°F	
-7	20	12
-12	10	20
-18	0	24
-23	-10	28
-29	-20	30
-34	-30	33
<-40	<-40	35

Inhibitor Package

ProCool™ utilizes a unique corrosion inhibitor package, which is made from non-toxic raw materials.

the range that is suitable for the metals in the Water Bath Vaporizer.

This inhibitor offers superior corrosion protection for most metals including carbon steel, brass, copper, stainless steel, cast iron, and many other alloys by creating a passive layer on the surface that contacts the ProCool™ and prevents corrosion from forming. It also stabilizes the pH of the fluid keeping it in

If the annual analysis indicates that the inhibitor package is nearing the end of its useful life, Alternate Energy Systems Inc. will recommend either a re-inhibition of the ProCool™ or a complete replacement. See page 7 of this brochure for additional details.

Technical Data ProCool™ Heat Transfer Fluid

General Properties

Vol. %	Wt. %	Freeze Point		Boiling Point		Refractive Index	Specific Gravity
		°F	°C	°F	°C	22°C (72°F)	22°C (72°F)
0	0.0	32	0	212	100.0	1.3328	1.000
5	5.2	29	-1.7	212	100.0	1.3385	1.005
10	10.5	26	-3.3	212	100.0	1.3439	1.010
15	15.6	23	-5	212	100.0	1.3501	1.015
20	20.8	19	-7.2	213	100.6	1.3665	1.020
21	21.8	17	-8.3	213	100.6	1.3576	1.021
22	22.9	17	-8.3	213	100.6	1.3590	1.022
23	23.9	16	-8.9	213	100.6	1.3601	1.023
24	24.9	15	-9.4	213	100.6	1.3613	1.024
25	25.9	14	-10.1	214	101.1	1.3626	1.025
26	27.0	13	-10.6	214	101.1	1.3629	1.026
27	28.0	12	-11.1	214	101.1	1.3651	1.027
28	29.0	10	-12.2	215	101.7	1.3663	1.028
29	30.1	9	-12.8	216	102.2	1.3676	1.029
30	31.1	8	-13.3	216	102.2	1.3689	1.030
31	32.1	7	-13.9	216	102.2	1.3699	1.031
32	33.1	5	-15.0	216	102.2	1.3711	1.032
33	34.1	4	-15.6	216	102.2	1.3722	1.032
34	35.1	2	-16.7	217	102.8	1.3734	1.033
35	36.1	1	-17.2	217	102.8	1.3745	1.034
36	37.2	-1	-18.3	217	102.8	1.3759	1.035
37	38.2	-3	-19.4	218	103.3	1.3769	1.036
38	39.2	-4	-20.0	218	103.3	1.3781	1.037
39	40.2	-6	-21.1	219	103.9	1.3792	1.038
40	41.2	-8	-22.2	219	103.9	1.3804	1.039
41	42.2	-10	-23.3	219	103.9	1.3815	1.040
42	43.2	-12	-24.4	219	103.9	1.3827	1.041
43	44.2	-14	-25.5	219	103.9	1.3838	1.042
44	45.2	-16	-26.7	220	104.4	1.3849	1.043
45	46.2	-18	-27.8	220	104.4	1.3860	1.044
46	47.2	-21	-29.4	220	104.4	1.3872	1.045
47	48.2	-23	-30.6	221	105.0	1.3883	1.046
48	49.2	-26	-32.2	221	105.0	1.3894	1.047
49	50.2	-28	-33.3	222	105.6	1.3905	1.048
50	51.2	-31	-35.0	222	105.6	1.3916	1.049
51	52.2	-34	-36.7	222	105.6	1.3926	1.049
52	53.2	-37	-38.3	223	106.1	1.3937	1.050
53	54.2	-40	-40.0	223	106.1	1.3947	1.050
54	55.2	-43	-41.7	223	106.1	1.3958	1.051
55	56.2	-46	-43.3	223	106.1	1.3968	1.052
56	57.2	-49	-45.0	224	106.7	1.3978	1.053
57	58.2	-53	-47.2	224	106.7	1.3988	1.054
58	59.2	-56	-48.9	224	106.7	1.4000	1.054
59	60.2	<-60	-51.1	225	107.2	1.4010	1.055
60	61.2	<-60	-51.1	225	107.2	1.4020	1.055
65	66.1	<-60	-51.1	227	108.3	1.4067	1.057
70	71.0	<-60	-51.1	230	110.0	1.4113	1.057
75	75.9	<-60	-51.1	238	114.4	1.4158	1.058
80	80.8	<-60	-51.1	246	118.9	1.4201	1.059
85	85.6	<-60	-51.1	258	125.6	1.4241	1.056
90	90.4	<-60	-51.1	270	132.2	1.4248	1.056
95	95.2	<-60	-51.1	310	154.4	1.4315	1.052

Technical Data ProCool™ Heat Transfer Fluid

1 cP = 0.001 Pa · s

Viscosity

Temperature		Viscosity in cP by Volume								
°F	°C	20%	25%	30%	35%	40%	45%	50%	55%	60%
-30	-34.4									498
-20	-28.8									299
-10	-23.3							96.0	140	183
0	-17.7					40.9	51.1	61.3	88.2	115
10	-12.2			13.4	20.2	27.0	33.8	40.6	57.4	74.2
20	-6.6	5.36	7.63	9.89	14.2	18.5	23.2	27.8	38.6	49.3
30	-1.1	4.23	5.85	7.46	10.3	13.1	16.4	19.7	26.7	33.7
40	4.4	3.41	4.58	5.75	7.68	9.60	12.0	14.3	19.0	23.7
50	10.0	2.79	3.66	4.52	5.87	7.21	8.96	10.7	13.9	17.1
60	15.5	2.32	2.97	3.62	4.59	5.56	6.85	8.13	10.4	12.6
70	21.1	1.95	2.45	2.94	3.66	4.38	5.36	6.34	7.93	9.51
80	26.6	1.66	2.05	2.43	2.98	3.52	4.28	5.04	6.19	7.34
90	32.2	1.43	1.74	2.04	2.46	2.88	3.48	4.08	4.93	5.77
100	37.7	1.25	1.49	1.73	2.07	2.4	2.88	3.35	3.99	4.62
120	48.8	0.97	1.14	1.30	1.52	1.73	2.05	2.36	2.74	3.11
140	60.0	0.78	0.90	1.01	1.16	1.31	1.53	1.75	1.99	2.22
160	71.1	0.64	0.73	0.82	0.93	1.04	1.20	1.35	1.51	1.66
180	82.2	0.54	0.61	0.68	0.77	0.85	0.97	1.08	1.19	1.29
200	93.3	0.46	0.52	0.58	0.65	0.71	0.80	0.88	0.96	1.04
220	104.4	0.40	0.45	0.50	0.56	0.61	0.68	0.74	0.80	0.86
240	115.5	0.36	0.40	0.44	0.49	0.53	0.59	0.64	0.69	0.73

Technical Data ProCool™ Heat Transfer Fluid

1 BTU/hr · ft · °F = 1.73 W/m · K

Thermal Conductivity

Temperature		Thermal Conductivity in Btu/hr · ft · °F by Volume								
°F	°C	20%	25%	30%	35%	40%	45%	50%	55%	60%
-30	-34.4									0.171
-20	-28.8							0.188	0.181	0.174
-10	-23.3							0.191	0.184	0.176
0	-17.7					0.211	0.203	0.194	0.186	0.178
10	-12.2			0.235	0.225	0.215	0.206	0.196	0.188	0.179
20	-6.6	0.262	0.251	0.239	0.229	0.218	0.209	0.199	0.190	0.181
30	-1.1	0.267	0.255	0.243	0.233	0.222	0.212	0.201	0.192	0.183
40	4.4	0.272	0.260	0.247	0.236	0.225	0.215	0.204	0.194	0.184
50	10.0	0.277	0.264	0.251	0.239	0.227	0.217	0.206	0.196	0.186
60	15.5	0.281	0.268	0.254	0.242	0.230	0.219	0.208	0.198	0.187
70	21.1	0.285	0.272	0.258	0.246	0.233	0.222	0.210	0.199	0.188
80	26.6	0.289	0.275	0.261	0.248	0.235	0.223	0.211	0.200	0.189
90	32.2	0.292	0.278	0.263	0.250	0.237	0.225	0.213	0.202	0.190
100	37.7	0.295	0.281	0.266	0.253	0.239	0.227	0.214	0.203	0.191
120	48.8	0.298	0.283	0.268	0.255	0.241	0.228	0.215	0.204	0.192
140	60.0	0.306	0.290	0.274	0.260	0.245	0.232	0.218	0.206	0.194
160	71.1	0.309	0.293	0.277	0.262	0.247	0.234	0.220	0.207	0.194
180	82.2	0.312	0.296	0.279	0.264	0.249	0.235	0.221	0.208	0.195
200	93.3	0.314	0.297	0.280	0.265	0.249	0.235	0.221	0.208	0.194
220	104.4	0.314	0.297	0.280	0.265	0.249	0.235	0.220	0.207	0.194

Technical Data ProCool™ Heat Transfer Fluid

1 BTU/lb_m · °F = 4186 J/kg · °C

Specific Heat

Temperature		Specific Heat in BTU/lb _m · °F by Volume								
°F	°C	20%	25%	30%	35%	40%	45%	50%	55%	60%
-30	-34.4									0.799
-20	-28.8									0.804
-10	-23.3									0.809
0	-17.7							0.855	0.832	0.809
10	-12.2					0.898	0.879	0.859	0.837	0.814
20	-6.6			0.936	0.919	0.902	0.883	0.864	0.842	0.82
30	-1.1	0.966	0.952	0.938	0.922	0.906	0.887	0.868	0.847	0.825
40	4.4	0.968	0.955	0.941	0.925	0.909	0.891	0.872	0.851	0.830
50	10.0	0.970	0.957	0.944	0.929	0.913	0.895	0.877	0.856	0.835
60	15.5	0.972	0.960	0.947	0.932	0.917	0.899	0.881	0.861	0.840
70	21.1	0.974	0.962	0.950	0.935	0.920	0.903	0.886	0.866	0.845
80	26.6	0.976	0.965	0.953	0.939	0.924	0.907	0.890	0.870	0.850
90	32.2	0.979	0.968	0.956	0.942	0.928	0.911	0.894	0.875	0.855
100	37.7	0.981	0.970	0.959	0.945	0.931	0.915	0.899	0.880	0.861
120	48.8	0.985	0.975	0.965	0.952	0.939	0.924	0.908	0.890	0.871
140	60.0	0.989	0.980	0.970	0.958	0.946	0.931	0.916	0.899	0.881
160	71.1	0.993	0.985	0.976	0.965	0.953	0.939	0.925	0.908	0.891
180	82.2	0.996	0.989	0.982	0.972	0.961	0.948	0.934	0.918	0.902
200	93.3	1.000	0.994	0.988	0.978	0.968	0.956	0.943	0.928	0.912
220	104.4	1.003	0.999	0.994	0.985	0.975	0.963	0.951	0.937	0.922
240	115.5	1.007	1.003	0.999	0.991	0.982	0.971	0.960	0.946	0.932

Technical Data ProCool™ Heat Transfer Fluid

1 lb_m/ft³ = 16 kg/m³

Density

Temperature		Density in lb _m /ft ³ by Volume								
°F	°C	20%	25%	30%	35%	40%	45%	50%	55%	60%
-30	-34.4									67.05
-20	-28.8							66.46	66.70	66.93
-10	-23.3							66.35	66.58	66.81
0	-17.7					65.71	65.97	66.23	66.46	66.68
10	-12.2			65.00	65.30	65.60	65.86	66.11	66.33	66.54
20	-6.6	64.23	64.57	64.90	65.19	65.48	65.73	65.97	66.18	66.38
30	-1.1	64.14	64.47	64.79	65.07	65.35	65.59	65.82	66.02	66.22
40	4.4	64.03	64.35	64.67	64.94	65.21	65.44	65.67	65.86	66.05
50	10.0	63.92	64.23	64.53	64.80	65.06	65.28	65.50	65.69	65.87
60	15.5	63.79	64.09	64.39	64.65	64.90	65.12	65.33	65.51	65.68
70	21.1	63.66	63.95	64.24	64.49	64.73	64.94	65.14	65.31	65.47
80	26.6	63.52	63.80	64.08	64.32	64.55	64.75	64.95	65.11	65.26
90	32.2	63.37	63.64	63.91	64.14	64.36	64.55	64.74	64.89	65.04
100	37.7	63.20	63.47	63.73	63.95	64.16	64.35	64.53	64.67	64.81
120	48.8	62.85	63.09	63.33	63.54	63.74	63.90	64.06	64.19	64.32
140	60.0	62.46	62.68	62.90	63.09	63.27	63.42	63.57	63.68	63.79
160	71.1	62.03	62.23	62.43	62.60	62.76	62.90	63.03	63.13	63.22
180	82.2	61.56	61.74	61.92	62.07	62.22	62.34	62.45	62.53	62.61
200	93.3	61.05	61.21	61.37	61.50	61.63	61.73	61.83	61.90	61.97
220	104.4	60.50	60.64	60.78	60.89	61.00	61.09	61.17	61.23	61.28
240	115.5	59.91	60.03	60.15	60.25	60.34	60.41	60.47	60.51	60.55

Technical Data ProCool™ Heat Transfer Fluid

1 psi = 6895 Pa = 0.069 bar = 51.7 mmHg = 21.7 inH₂O

Vapor Pressure

Temperature		Vapor Pressure in psia by Volume								
°F	°C	20%	25%	30%	35%	40%	45%	50%	55%	60%
100	37.7	0.9	0.9	0.9	0.9	0.9				
110	43.3	1.9	1.6	1.2	1.2	1.2	1.2	1.1	1.1	1.0
120	48.8	1.7	1.7	1.6	1.5	1.5	1.5	1.5	1.5	1.4
130	54.4	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.8
140	60.0	2.8	2.8	2.7	2.7	2.6	2.6	2.5	2.4	2.3
150	65.5	3.6	3.6	3.5	3.5	3.4	3.4	3.2	3.0	3.0
160	71.1	4.6	4.5	4.4	4.4	4.3	4.2	4.1	4.0	3.8
170	76.6	5.8	5.8	5.6	5.4	5.4	5.3	5.2	5.0	4.8
180	82.2	7.2	7.1	7.0	6.9	6.7	6.6	6.5	6.2	5.9
190	87.7	9.0	8.9	8.7	8.5	8.3	8.2	8.1	7.8	7.4
200	93.3	11.0	10.9	10.7	10.5	10.2	10.1	9.9	9.5	9.1
210	98.8	13.5	13.5	13.1	12.8	12.5	12.3	12.1	11.6	11.1
220	104.4	16.4	16.4	15.9	15.6	15.2	15.0	14.8	14.2	13.6
230	110.0	19.8	19.5	19.2	18.8	18.4	17.8	17.8	17.1	16.4
240	115.5	23.8	23.4	23.0	22.5	22.0	21.7	21.4	20.6	19.7
250	121.1	28.4	27.9	27.4	26.9	26.3	26.0	25.6	24.6	23.5

How Does Corrosion Happen?

Corrosion, as opposed to oxidation, is an electrochemical process that occurs naturally in all metallic objects. In order for corrosion to take place, there must be a positively charged area called the anode, a negatively charged area called the cathode, a path for ionic current flow called an electrolyte, and a path for electronic current flow which is the metal. The difference in electrical potential between the anode and cathode in the presence of an electrolyte creates a galvanic cell, and a current flow is induced.

In any situation such as this, the current flow causes metal loss in the anodic area of the circuit, resulting in corrosion. If any of the aforementioned conditions for corrosion can be suppressed or eliminated, metal loss will be equally reduced.

An excellent example of this phenomenon is a typical car battery. The battery has metallic positive and negative terminals (the anode and cathode), and an acid/water solution (the electrolyte). Current flows from the high-potential anode to the low-potential cathode through the electrolyte. Corrosion is always prevalent on the positive terminal of the battery.

Water bath vaporizers likewise contain all of the “ingredients” for metallic corrosion. In order to minimize corrosion, certain steps must be taken. These steps include grounding the vaporizer skid, and addition of a rust-inhibiting antifreeze to the water bath. Grounding can be accomplished by simply attaching the vaporizer frame to a grounding rod via a 4 AWG or larger stranded copper wire. A brief discussion of the recommended antifreeze solution follows.

Sources: www.alliedcorrosion.com, www.cathodicprotection.com

Water Bath Vaporizer Filling Procedure

The best option for adding ProCool™ heat transfer solution to the vaporizer is to procure the solution pre-mixed, and then to add the pre-mixed solution to the vaporizer.

The second best option is to mix the solution at the desired ratio on-site prior to filling the vaporizer.

However, if neither of these options is available the following procedure should be used to introduce the antifreeze solution into the vaporizer.

1. Calculate the proper quantity of ProCool™ heat transfer solution and de-ionized water needed to achieve the desired result. Typically, a 50% glycol / 50% de-ionized water solution is adequate.

The calculations can be made using the following formulae:

$$\text{(Water Capacity of Vaporizer in Gallons)} \times \text{(Volume \% ProCool™ heat transfer solution)} \\ = \text{Gallons of ProCool™ needed to provide desired freeze protection}$$

$$\text{(Water Capacity of Vaporizer in Gallons)} - \text{(Gallons of ProCool™ heat transfer solution needed)} \\ = \text{Gallons of de-ionized water needed to fill vaporizer water bath}$$

2. Introduce the number of gallons of de-ionized water needed to fill the vaporizer water bath calculated in step 1. **Do not introduce the ProCool™ heat transfer solution first.**
3. Add the number of gallons of ProCool™ heat transfer solution needed to provide desired freeze protection calculated in step 1.
4. Circulate the mixture for at least 24 hours to ensure proper mixing. Check the liquid concentration with a refractometer or other method to verify the correct mixture.

The mixture should be monitored periodically in order to ensure the proper mix ratio and water level. Some physical properties of ProCool™ propylene glycol solutions are available at http://www.altenergy.com/Downloads/PDF_Public/ProCool™_Brochure_Excerpt_100414.pdf.

Who is Alternate Energy Systems, Inc. ?

After working for other manufacturers of LPG vaporizers and LPG / air systems for several years, John E. Hallberg founded Alternate Energy Systems, Inc. in 1974 in Peachtree City, located just 20 minutes south-west of the Atlanta airport. He successfully set out to design and manufacture products which were superior to those of his competitors. As a result, AES became very quickly known as the innovative manufacturer of quality products. Soon, the customer list included a representative cross-section of the Fortune 500 companies in the U.S.



Through the years, AES has constantly added new products, and has further improved the design of existing products, keeping us ahead of the competition. Several designs, including those for LPG/Air mixing systems, were awarded national and international patents.

Today, AES is owned by Wolfgang Driftmeier. With his manufacturing background and his experience in sales and marketing, the company focus is clearly on "... offering the best product design, combined with quality workmanship, at a competitive price, to the full satisfaction of our customers, at all times ...".

AES is committed to serving customers in the U.S. through a network of sales specialists, technical support personnel, distributors and installers, and international customers in selected countries through qualified representatives.

Please visit our web site at www.altenergy.com for updated versions of all data sheets, price lists, application notes, a list of authorized distributors, and other documents that are only available online.

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