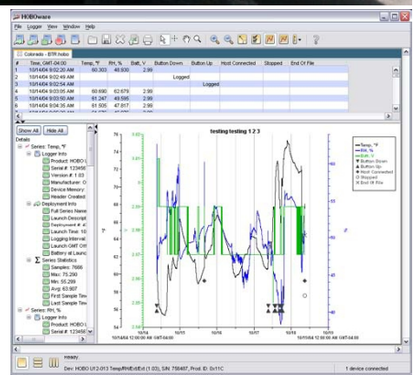
ROLAND
ENGINEERING SERVICES

Chiller Performance Evaluation & Analysis

Thermo King
Riviera Beach, Florida

Performance Evaluation November 7, 2011 - November 29, 2011

Project Details



Location: **Riviera Beach, Florida**

Equipment: **Thermo King Model Super II TC12**

B/M # 092139 / Serial 11584Q8816

Purpose:

- **Establish Baseline Performance**
- **Install Cold-Plus™**
- **Measure Post Installation Performance**
- **Determine Percentage of Performance Improvement**

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Chiller Performance Evaluation Method

Theory: **Cold Plus™** will treat the insides of the copper tubing, reducing the oil fouling of the refrigeration system. This reduction of oil fouling will increase the heat transfer ability of the system, allowing it to do the same work with less energy.

Method of evaluation: Compare two sets of conditions, one set of ***before*** we added Cold Plus to the system and one set ***after*** we added Cold Plus to the system.
We need to define some terms for this test.

Work: for this test, the work performed by the refrigeration unit is the amount of btu's removed from the interior of the refrigerated trailer. The heat (false load) that we put inside the unit is a fixed electric heater and an air handler to circulate the heat generated in the trailer. The additional load came from the heat gain of the walls of the trailer as heat moves from the outside inward.

Energy: for this test, is simply fuel consumed. The fuel tank was topped to an exact level and at the end of the pre-test and post-test the fuel was restored to the same exact level. We weighed the fuel supply tank before and after to calculate the exact weight of fuel used for the two different runs.

Data logged: Roland Engineering set up an On-Set data acquisition system and set up to log seven channels. We logged two return air temps, two supply air temps, on the interior of the trailer, one ambient air temp and one surface temp on the exterior of the trailer. We also used a CT to measure current flow to the "false load" and air handler.

Calculations : Three things must be calculated to compare the pre and post treatment values.

Heat gain from the "false load" : the electric heat and blower motor draw 8 amps of 230 volt (single phase). The calculation for the "false load" heat then would be (8x230x3.414) or 6281 btu's. The CT reading is 5.0 when the full load is there and an adjustment was made in the individual 15 minute logging to adjust for slightly over or below the full load, ie if the CT reading for the period was 5.1 then the heat calculation would be 5.1/5 x (8x230x3.414).

Heat gain for a 15 minute period. The physical heat gain would be a calculation of the square footage of exposure times the 1/R factor for the insulation times the delta T. (the temperature difference between the outside and the interior)
To account for the fact that one side of the trailer was exposed to direct sun light, 50% of the exposed footage considered surface temp as the outside temp, and the other 50% of exposed footage considered the ambient temp as the outside temp. The sum of both of these heat gains would equal the total heat gain through the walls of the trailer. The doors of the trailer remained closed through the test and therefore calculation on the change in the latent heat values were not considered. These values may not be "absolute" in the amount of heat moved, but the conditions of the trial run before and after the treatment will be very similar so that the comparison should be of value.

Fuel Used: The on-board fuel tank was topped off to an exact level before the start of the test after the pre-treatment run and after thepost treatment run. The fuel used was determined by weighing the source fuel tank before each topping off the on-board fuel tank.

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Chiller Performance Evaluation & Analysis

Raw Data Downloaded from HoboLink Server

Note: The data involves hundreds of pages therefore a few sample pages are included in this report for illustration purposes.

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Day One Pre-treatment

		Ambient	Supply 1	Supply 2	Return 1	Return 2	Sun	Electric Heat BTU	Sunlight heat	Shaded heat	Delta T
11/7/2011 8:00	0.00	77.34	73.87	73.81	73.94	73.81	82.89	0	168	64	0.07
11/7/2011 8:15	0.00	83.19	73.94	73.9	73.99	73.9	100.06	0	490	173	0.05
11/7/2011 8:30	0.00	85.44	54.82	50.45	58.32	58.84	102.72	0	835	510	3.5
11/7/2011 8:45	1.00	82.89	34.86	31.03	41.65	41.38	93.56	313	976	775	6.79
11/7/2011 9:00	5.00	90.1	34.32	30.78	42.39	41.74	112.39	1564	1316	897	8.07
11/7/2011 9:15	5.00	81.73	32.59	28.83	40.71	39.92	91.78	1564	960	771	8.12
11/7/2011 9:30	5.00	84.09	30.63	26.85	38.66	37.74	86.58	1564	901	854	8.03
11/7/2011 9:45	5.00	87.26	28.8	24.98	36.84	35.83	99.72	1564	1182	948	8.04
11/7/2011 10:00	5.00	89.55	27.28	23.41	35.29	34.21	105.66	1564	1323	1020	8.01
11/7/2011 10:15	4.80	90.84	25.9	21.92	33.84	32.79	109.31	1501	1419	1071	7.94
11/7/2011 10:30	5.00	91.92	25.2	21.13	33.08	32	115.84	1564	1556	1106	7.88
11/7/2011 10:45	5.00	89.64	24.33	20.1	32.29	31.08	109.26	1564	1447	1078	7.96
11/7/2011 11:00	5.00	89.37	23.68	19.24	31.64	30.33	106.07	1564	1399	1085	7.96
11/7/2011 11:15	4.80	91.45	23.13	18.48	31.08	29.77	113.11	1501	1542	1135	7.95
11/7/2011 11:30	4.80	96.58	22.41	17.42	30.33	28.99	115.84	1501	1607	1245	7.92
11/7/2011 11:45	5.00	94.6	22.03	16.65	29.91	28.47	112.44	1564	1551	1216	7.88
11/7/2011 12:00	4.80	93.61	21.34	15.62	29.35	27.75	108.03	1501	1479	1208	8.01
11/7/2011 12:15	5.00	98.33	21.58	15.85	29.41	27.7	120.33	1564	1709	1295	7.83
11/7/2011 12:30	**4.80**	**98.24**	**52.47**	**51.37**	**49.57**	**50.88**	**120.27**	**1501**	**1329**	**915**	**-2.9**
11/7/2011 12:45	**5.00**	**97.84**	**79.09**	**79.88**	**71.4**	**73.78**	**121.68**	**1564**	**945**	**497**	**-7.69**
11/7/2011 13:00	**5.00**	**98.98**	**100.36**	**102.72**	**87.62**	**91.36**	**121.19**	**1564**	**631**	**214**	**-12.74**
11/7/2011 13:15	**4.80**	**98.73**	**74.73**	**69.42**	**75.72**	**76.59**	**119.12**	**1501**	**816**	**432**	**0.99**
11/7/2011 13:30	5.00	98.13	55.87	53.91	62.49	62.31	119.55	1564	1072	670	6.62
11/7/2011 13:45	5.00	98.62	47.1	45.93	55.26	54.77	116.29	1564	1147	815	8.16
11/7/2011 14:00	5.00	98.28	42.62	41.79	51.03	50.54	115.43	1564	1210	888	8.41
11/7/2011 14:15	5.10	96.53	39.97	39.16	48.31	47.73	114.87	1595	1251	906	8.34
11/7/2011 14:30	5.00	95.09	37.89	37.08	46.35	45.54	111.06	1564	1216	916	8.46
11/7/2011 14:45	5.00	95.04	35.64	34.66	44.22	43.21	107.76	1564	1194	955	8.58
11/7/2011 15:00	5.10	95.95	33.93	32.94	42.57	41.47	109.74	1595	1263	1003	8.64
11/7/2011 15:15	5.00	96.01	32.34	31.28	41.14	39.88	109.9	1564	1292	1031	8.8
11/7/2011 15:30	5.10	94.51	29.3	28.17	39.04	37.85	105.4	1595	1247	1043	9.74
11/7/2011 15:45	5.10	89.96	27.9	26.58	37.71	36.41	98.38	1595	1140	982	9.81
11/7/2011 16:00	5.10	88.27	26.44	24.93	36.21	34.92	94.51	1595	1096	979	9.77
11/7/2011 16:15	5.10	87.8	25.2	23.63	34.95	33.58	92.25	1595	1077	993	9.75
11/7/2011 16:30	5.10	87.94	23.36	21.58	33.24	31.75	91.31	1595	1091	1028	9.88
11/7/2011 16:45	5.10	86.31	22.08	20.05	31.89	30.43	89.19	1595	1077	1023	9.81
11/7/2011 17:00	5.10	84.76	21.92	19.58	30.88	29.52	87.12	1595	1057	1013	8.96
11/7/2011 17:15	5.10	80.8	57.29	56.43	53.69	55.51	82.98	1595	551	510	233.28
11/7/2011 17:30	5.10	78.39	83.7	84.49	74.43	77.59	80.06	1595	106	74	-9.27
11/7/2011 17:45	4.80	76.82	103.75	104.61	89.49	93.99	77.81	1501	-220	-238	-14.26
11/7/2011 18:00		Ambient	Supply 1	Supply 2	Return 1	Return 2	Sun	56523	43448	33100	133070

Derfrost Period

ROLAND ENGINEERING SERVICES

Day Two Pre-treatment

		Ambient	Supply 1	Supply 2	Return 1	Return 2	Sun	Electric Heat BTU	Sunlight heat	Shaded heat	Delta T
11/8/2011 8:00	0.00	75.78	69.85	69.73	69.91	69.98	77.38	0	140	110	0.06
11/8/2011 8:15	0.00	82.4	51.67	49.69	55.96	56.43	94.57	0	726	497	4.29
11/8/2011 8:30	0.00	82.71	27.7	28.06	37.36	36.5	93.42	0	1054	852	9.66
11/8/2011 8:45	0.00	87.48	18.19	19.42	28.33	27.37	106.65	0	1472	1112	10.14
11/8/2011 9:00	0.00	87.94	12.13	14.09	22.41	21.47	111.33	0	1671	1232	10.28
11/8/2011 9:15	0.00	82.35	7.29	9.84	17.96	16.83	93.85	0	1426	1210	10.67
11/8/2011 9:30	0.00	87.21	4.46	7.34	14.95	13.89	103.64	0	1667	1358	10.49
11/8/2011 9:45	0.00	90.52	2.91	6.03	13.26	12.13	116.71	0	1944	1452	10.35
11/8/2011 10:00	0.00	86.16	1.71	4.96	12.06	10.9	104.25	0	1733	1393	10.35
11/8/2011 10:15	0.00	82.85	0.41	3.79	10.71	9.59	90.84	0	1506	1356	10.3
11/8/2011 10:30	0.00	83.46	-0.78	2.7	9.59	8.51	92.48	0	1558	1388	10.37
11/8/2011 10:45	0.00	85.12	-1.98	1.56	8.44	7.29	95.81	0	1642	1441	10.42
11/8/2011 11:00	0.00	89.69	-2.31	1.26	8.04	6.87	108.88	0	1895	1535	10.35
11/8/2011 11:15	0.00	86.31	-0.85	2.25	7.83	6.51	97.02	0	1676	1475	8.68
11/8/2011 11:30	**0.00**	**94.28**	**17.6**	**19.13**	**14.7**	**14.76**	**117.59**	**0**	**1934**	**1496**	**-2.9**
11/8/2011 11:45	**0.00**	**86.61**	**29.52**	**29.66**	**23.95**	**23.18**	**105.13**	**0**	**1526**	**1178**	**-5.57**
11/8/2011 12:00	**0.00**	**77.99**	**35.92**	**35.83**	**30.07**	**28.22**	**79.34**	**0**	**926**	**901**	**-5.85**
11/8/2011 12:15	**0.00**	**86.4**	**39.74**	**40.01**	**32.99**	**31.75**	**90.61**	**0**	**1083**	**1004**	**-6.75**
11/8/2011 12:30	**0.00**	**90.34**	**42.71**	**43.16**	**37.42**	**35.98**	**102.11**	**0**	**1216**	**995**	**-5.29**
11/8/2011 12:45	0.00	91.63	37.65	39.07	38.41	37.65	106.92	0	1288	1000	0.76
11/8/2011 13:00	0.00	76.68	16.41	19.13	24.98	24.12	82.13	0	1074	972	8.57
11/8/2011 13:15	0.00	75.47	8.64	12.33	17.73	17.01	77.38	0	1121	1085	9.09
11/8/2011 13:30	0.00	79.52	5.88	9.84	14.58	14.27	83.16	0	1289	1221	8.7
11/8/2011 13:45	0.00	91.6	5.04	9.12	13.33	13.14	100.17	0	1632	1471	8.29
11/8/2011 14:00	0.00	90.75	4.46	8.78	12.7	12.51	101.16	0	1663	1467	8.24
11/8/2011 14:15	0.00	87.44	4.15	8.58	12.38	12.2	97.5	0	1600	1411	8.23
11/8/2011 14:30	0.80	84.15	4.01	8.58	12.33	12.25	90.84	250	1476	1350	8.32
11/8/2011 14:45	5.00	83.73	9.79	14.88	19.63	19.58	89.31	1564	1310	1205	9.84
11/8/2011 15:00	4.80	87.89	13.14	18.19	22.91	23.02	95.86	1501	1371	1221	9.77
11/8/2011 15:15	5.00	81.43	14.58	19.71	24.49	24.66	85.62	1564	1149	1070	9.91
11/8/2011 15:30	5.00	83.61	15.93	20.89	25.79	25.95	87.53	1564	1160	1087	9.86
11/8/2011 15:45	5.10	90.43	17.78	22.48	27.43	27.54	97.45	1595	1316	1184	9.65
11/8/2011 16:00	5.10	88.3	19.63	23.95	28.89	28.99	93.85	1595	1221	1117	9.26
11/8/2011 16:15	5.10	88.07	21.47	25.41	30.33	30.38	92.39	1595	1166	1085	8.86
11/8/2011 16:30	5.20	87.62	23.13	26.91	31.64	31.78	90.46	1627	1106	1052	8.51
11/8/2011 16:45	5.10	84.33	31.59	32.88	36.32	36.64	86.67	1595	946	902	4.73
11/8/2011 17:00	5.10	83.16	57.29	57.04	53.47	55.35	83.16	1595	558	558	-3.82
11/8/2011 17:15	5.10	80.46	76.37	77.77	68.23	71.53	79.97	1595	221	230	-8.14
11/8/2011 17:30	5.10	77.41	82.85	80.98	75.25	78.17	77.25	1595	38	41	-7.6
11/8/2011 17:45	5.10	76.77	51.03	47.97	54.55	55.65	76.68	1595	416	418	3.52
11/8/2011 18:00	5.10	76.77	40.53	38.98	46.74	46.62	76.33	1595	556	564	6.21
11/8/2011 18:15	2.90	75.25	35.15	34.66	40.59	39.92	75.42	907	655	651	5.44
								23,335	51,129	44,348	236.19
											118,811
						Total work		111,711	133,070		
								111,811	118,811		
						Two day total			251,881		

Derfrost Period

ROLAND ENGINEERING SERVICES

Day One Post-treatment

		Ambient	Supply 1	Supply 2	Return 1	Return 2	Sun Temp	Elect Heat BTU	Sunlight heat	Shaded heat	
11/28/2011 8:45	3.50	78.6	59.67	55.72	64.29	64.54	80.4	1095	303	269	4.62
11/28/2011 9:00	5.10	84.63	44.44	40.15	52.38	52.29	93.9	1595	780	606	7.94
11/28/2011 9:15	5.00	85.89	39.65	35.83	47.52	47.37	97.21	1564	934	721	7.87
11/28/2011 9:30	5.10	89.96	35.92	32.2	43.95	43.57	108.09	1595	1206	865	8.03
11/28/2011 9:45	5.00	89.46	32.68	28.99	40.86	40.35	106.54	1564	1235	913	8.18
11/28/2011 10:00	5.10	90.61	30.22	26.58	38.46	37.85	107.76	1595	1303	980	8.24
11/28/2011 10:15	5.00	92.62	28.36	24.55	36.55	35.89	112.28	1564	1423	1054	8.19
11/28/2011 10:30	5.00	89.82	26.38	22.35	34.61	33.84	103.59	1564	1297	1038	8.23
11/28/2011 10:45	5.00	91.69	24.55	20.26	32.79	32	107.6	1564	1406	1107	8.24
11/28/2011 11:00	4.80	89.73	23.02	18.48	31.24	30.38	105.03	1501	1387	1099	8.22
11/28/2011 11:15	4.80	89.28	21.69	16.7	29.88	28.94	101.35	1501	1343	1116	8.19
11/28/2011 11:30	4.80	87.17	20.55	15.13	28.69	27.64	95.76	1501	1261	1099	8.14
11/28/2011 11:45	5.00	87.21	19.42	13.59	27.43	26.38	96.33	1564	1295	1124	8.01
11/28/2011 12:00	5.00	81.16	18.25	12.51	26.44	25.25	90.37	1564	1202	1029	8.19
11/28/2011 12:15	5.10	79.27	17.19	11.43	25.57	24.12	84.72	1595	1112	1009	8.38
11/28/2011 12:30	5.00	74.46	15.67	9.52	24.17	22.53	76.59	1564	985	945	8.5
11/28/2011 12:45	**5.10**	**76.95**	**42.57**	**41.04**	**40.62**	**41.7**	**79.18**	**1595**	**725**	**683**	**-1.95**
11/28/2011 13:00	**5.00**	**81.77**	**73**	**73.13**	**64.76**	**67.28**	**86.22**	**1564**	**403**	**320**	**-8.24**
11/28/2011 13:15	**5.00**	**86.4**	**95.41**	**96.87**	**81.37**	**85.68**	**95.7**	**1564**	**269**	**95**	**-14.04**
11/28/2011 13:30	**5.00**	**89.69**	**75.94**	**71.96**	**75.16**	**76.37**	**100.65**	**1564**	**479**	**273**	**-0.78**
11/28/2011 13:45	5.00	91.6	50.67	48.81	57.85	58.28	103.95	1564	866	634	7.18
11/28/2011 14:00	5.00	88.12	39.97	39.22	49.06	49.3	95.9	1564	880	734	9.09
11/28/2011 14:15	5.10	85.89	33.78	33.78	43.57	43.66	92.8	1595	925	795	9.79
11/28/2011 14:30	5.00	84.54	28.89	29.66	39.31	39.27	92.16	1564	993	850	10.42
11/28/2011 14:45	5.00	84.24	25.3	26.44	35.92	35.83	89.08	1564	999	908	10.62
11/28/2011 15:00	5.10	85.71	22.8	24.28	33.44	33.39	89.96	1595	1062	982	10.64
11/28/2011 15:15	5.00	86.25	21.69	23.41	32.23	32.09	90.9	1564	1103	1015	10.54
11/28/2011 15:30	5.00	84.85	19.81	21.74	30.58	30.43	87.98	1564	1079	1020	10.77
11/28/2011 15:45	5.00	83.64	17.96	19.99	28.63	28.63	85.77	1564	1074	1034	10.67
11/28/2011 16:00	5.00	83.07	16.23	18.3	26.96	26.91	85.03	1564	1091	1055	10.73
11/28/2011 16:15	5.10	83.1	14.83	17.01	25.57	25.52	85.17	1595	1120	1081	10.74
11/28/2011 16:30	5.10	81.77	13.59	15.67	24.33	24.22	83.01	1595	1103	1080	10.74
11/28/2011 16:45	5.10	81.16	12.13	14.14	22.86	22.75	81.95	1595	1111	1096	10.73
11/28/2011 17:00	5.20	80.8	11.03	13.08	21.74	21.69	81.16	1627	1117	1110	10.71
11/28/2011 17:15	5.10	80.31	10.18	12.33	21.02	20.79	80.49	1595	1118	1114	10.84
11/28/2011 17:30	5.10	78.48	44.26	43.48	41.09	42.89	78.57	1595	704	703	256.37
11/28/2011 17:45	5.00	77.41	68.61	67.62	61.75	63.52	76.89	1564	285	294	
11/28/2011 18:00	5.00	76.21	71.15	69.21	67.59	67.55	75.42	1564	147	162	
11/28/2011 18:15	5.00	75.9	73.04	72.3	71.92	71.53	74.95	1564	57	75	
11/28/2011 18:30	0.80	75.63	73.94	73.56	73.65	73.44	74.59	250	18	37	512.74
		Ambient	Supply 1	Supply 2	Return 1	Return 2	Sun	61027	37201	32127	130,355

Derfrost Period

ROLAND ENGINEERING SERVICES

Day Two Post-treatment

		Ambient	Supply 1	Supply 2	Return 1	Return 2	Sun	Electric Heat BTU	Sunlight heat	Shaded heat	Delta T
11/29/2011 8:00	0.00	66.6	65.88	65.79	65.88	66.04	67.15	0	24	14	0
11/29/2011 8:15	2.50	66.9	62.06	61	64.38	64.8	67.46	782	58	47	2.32
11/29/2011 8:30	5.00	71.83	37.62	36.32	47.7	47.61	71.62	1564	450	454	10.08
11/29/2011 8:45	5.00	74.43	26.11	25.52	37.62	37.04	74.89	1564	701	692	11.51
11/29/2011 9:00	4.80	74.77	19.35	19.18	30.94	30.38	76.51	1501	857	824	11.59
11/29/2011 9:15	4.80	69.82	15.19	15.49	26.58	26.06	73.44	1501	881	813	11.39
11/29/2011 9:30	4.80	71.71	11.48	11.8	22.96	22.3	74.82	1501	975	916	11.48
11/29/2011 9:45	5.00	71.83	9.18	9.72	20.44	19.81	77.68	1564	1076	966	11.26
11/29/2011 10:00	4.80	73.47	7.83	8.44	18.9	18.3	81.64	1501	1179	1026	11.07
11/29/2011 10:15	4.70	72.64	7.14	7.9	18.12	17.6	79.7	1470	1157	1025	10.98
11/29/2011 10:30	4.80	72.61	6.37	7.41	17.47	16.88	77.59	1501	1130	1036	11.1
11/29/2011 10:45	4.70	73.47	5.81	7.07	16.95	16.34	80.13	1470	1188	1062	11.14
11/29/2011 11:00	4.80	73.99	5.31	6.73	16.52	15.98	80.89	1501	1210	1080	11.21
11/29/2011 11:15	4.80	73.81	4.89	6.44	16.11	15.57	79.88	1501	1199	1085	11.22
11/29/2011 11:30	5.00	74.37	4.53	6.3	15.85	15.37	80.4	1564	1213	1100	11.32
11/29/2011 11:45	5.00	74.82	4.3	6.17	15.67	15.13	81.01	1564	1228	1112	11.37
11/29/2011 12:00	5.00	76.24	4.15	6.24	15.62	15.13	83.61	1564	1278	1139	11.47
11/29/2011 12:15	5.10	77.9	19.53	19.92	23.13	24.22	85.35	1595	1169	1029	3.6
11/29/2011 12:30	**5.00**	**78.6**	**56.82**	**56.86**	**49.78**	**52.77**	**87.62**	**1564**	**711**	**542**	**-7.04**
11/29/2011 12:45	**5.00**	**78.39**	**77.34**	**78.33**	**65.14**	**68.95**	**86.34**	**1564**	**398**	**249**	**-12.2**
11/29/2011 13:00	**5.00**	**84.36**	**79.09**	**76.37**	**70.68**	**73.29**	**100.2**	**1564**	**555**	**257**	**-8.41**
11/29/2011 13:15	5.00	87.44	42.85	38.93	48.18	48.4	110.62	1564	1174	738	5.33
11/29/2011 13:30	5.10	86.22	31.33	28.42	39.07	38.7	104.61	1595	1232	886	7.74
11/29/2011 13:45	4.80	88.07	23.9	21.13	32.68	31.89	110.95	1501	1471	1041	8.78
11/29/2011 14:00	5.00	87.21	19.06	16.41	28.17	27.32	109.74	1564	1533	1110	9.11
11/29/2011 14:15	4.80	81.52	15.75	12.88	25.03	24.01	107.44	1501	1549	1062	9.28
11/29/2011 14:30	4.70	78.78	13.21	10.24	22.59	21.52	101.52	1470	1484	1056	9.38
11/29/2011 14:45	4.80	78.33	11.28	8.04	20.79	19.58	85.26	1501	1212	1082	9.51
11/29/2011 15:00	4.80	77.65	10.24	6.73	19.58	18.43	82.04	1501	1174	1091	9.34
11/29/2011 15:15	4.80	76.89	9.39	5.67	18.82	17.55	81.01	1501	1169	1091	9.43
11/29/2011 15:30	5.00	76.24	8.64	4.75	17.96	16.7	78.51	1564	1138	1095	9.32
11/29/2011 15:45	5.00	75.94	8.37	4.3	17.65	16.34	77.68	1564	1128	1096	9.28
11/29/2011 16:00	5.00	75.47	7.97	3.58	17.19	15.8	76.86	1564	1122	1095	9.22
11/29/2011 16:15	5.00	75.29	7.63	2.98	16.88	15.37	76.37	1564	1118	1098	9.25
11/29/2011 16:30	5.10	74.98	7.41	2.53	16.59	15.13	75.47	1595	1107	1097	9.18
11/29/2011 16:45	5.10	74.21	6.93	1.78	16.11	14.58	74.68	1595	1101	1092	9.18
11/29/2011 17:00	5.20	73.22	24.12	21.4	25.41	26.17	73.13	1627	897	899	279.79
		Ambient	Supply 1	Supply 2	Return 1	Return 2	Sun	54,677	38,244	33,098	126,019
	Pre	251881							Total Heat	112,811	130,350
	Post	256369	1.018			456114	1.811	1.173		112,911	126,019
2% more work on 10% less fuel (without considering spillage)											256,369

Derfrost Period

ROLAND
ENGINEERING SERVICES

Chiller Performance Evaluation Summary

Summary of Trial										
Thermo King										
Model no. Super II TC12										
B/M no. 092139										
Serial 11584Q8816			Refrigerant R-404 (18 lbs of charge)							
			Oil charge 7 liters							
			Cold Plus added 18 ounces							
Pre treatment			Total Btu's removed			Fuel required to "top off"				
Day 1	11/7/2011		133,070			Wt 1	327			
Day 2	11/8/2011		118,811			Wt 2	198			
		Total work pre	251,881			net wt	129	pounds		
Post treatment						Fuel required to "top off"				
Day 1	11/28/2011		130,355			Wt 1	504			
Day 2	11/29/2011		126,019			Wt 2	392			
		Total work post	256,374			net wt *	112			
		Post/Pre	1.018			Pre / post	1.152	**15.18%**	Less fuel used	
							1.018	**1.78%**	More work done	
						Total	1.170	**16.96%**	Total improvement.	

Chiller Performance Delta Summary

Pre CP Delta	Post CP Delta				
6.79	7.94		4.29	10.08	
8.07	7.87		9.66	11.51	
8.12	8.03		10.14	11.59	
8.03	8.18		10.28	11.39	
8.04	8.24		10.67	11.48	
8.01	8.19		10.49	11.26	
7.94	8.23		10.35	11.07	
7.88	8.24		10.35	10.98	
7.96	8.22		10.3	11.1	
7.96	8.19		10.37	11.14	
7.95	8.14		10.42	11.21	
7.92	8.01		10.35	11.22	
7.88	8.19		8.68	11.32	
8.01	8.38		8.57	11.37	
7.83	8.5		9.09	11.47	
6.62	7.18		8.7	5.33	
8.16	9.09		8.29	7.74	
8.41	9.79		8.24	8.78	
8.34	10.42		8.23	9.11	
8.46	10.62		8.32	9.28	
8.58	10.64		9.84	9.38	
8.64	10.54		9.77	9.51	
8.8	10.77		9.91	9.34	
9.74	10.67		9.86	9.43	
9.81	10.73		9.65	9.32	
9.77	10.74		9.26	9.28	
9.75	10.74		8.86	9.22	
9.88	10.73		8.51	9.25	
9.81	10.71		4.73	9.18	
8.96	10.84		266.18	9.18	
252.12	276.76			301.52	
8.404	9.225	17.629	9.179	10.051	19.229
	1.098	8.815			9.615
		Pre CP Avg			Post CP Avg

ROLAND
ENGINEERING SERVICES

Chiller Performance Evaluation & Analysis Summary

Test results:

Our goal was to compare the amount of work done with a pound of fuel before and after treating the system with Cold Plus™. Luckily we had two similar days (ambient conditions) to compare.

The total work done by the refrigeration system for the ***before*** (Cold Plus) days, was 251,881 BTUs.

The total work done by the refrigeration system for the ***after*** (Cold Plus) days was 256,374 BTUs.

These values illustrate that we did **1.78% more work** in the two ***after*** (Cold Plus) days.

The fuel used doing the ***before*** work, was 129 pounds, and the fuel used doing the ***after*** work was 112 lbs. These values illustrate that we used 15.18% less fuel in the ***after*** (Cold Plus) days.

Both of the factors above are of benefit to our system, therefore we would add the benefits to get a **total improvement of 16.96%**.

Review of the data would show that the temperature drop across the coil on average was 9% greater in the ***after*** days. This would suggest that the system had more strength or capacity, but our goal for this test was to demonstrate efficiency, not specifically capacity.

Conclusion:

Comparing the "before" and "after" treatment data, demonstrates an improvement of nearly 17%! Less fuel consumed while doing the same amount of work, demonstrates an improvement in efficiency. The 17% increase in efficiency should directly result in a 17% savings for every hour that the machine runs.

Comment:

Observing the temperature drop across the evaporator, we noticed that the second day of the "after" treatment run had the highest temperature drop.

Cold Plus™ needs run time to take effect, and the only run time, was the two days of "after" treatment operation. I think the system will continue to improve as the **Cold Plus™** finishes treating the inside of the tubing.

