

AFT Fathom Model

General

Title: AFT Fathom Model

Analysis run on: 12/5/2011 8:04:52 AM

Application version: AFT Fathom Version 7.0 (2008.02.22)

Input File: H:\Projects\University of Wisconsin\10723-00 Platteville Master Plan\Mechanical\Flow Modeling\Flow Modeling AFT Files 12-2-11\Chilled Water\UWP Chilled Water Existing.fth

Execution Time= 0.11 seconds

Total Number Of Head/Pressure Iterations= 0

Total Number Of Flow Iterations= 2

Total Number Of Temperature Iterations= 0

Number Of Pipes= 67

Number Of Junctions= 64

Matrix Method= LU Decomposition

Pressure/Head Tolerance= 0.0001 relative change

Flow Rate Tolerance= 1850 gal/min

Flow Relaxation= (Automatic)

Pressure Relaxation= (Automatic)

Constant Fluid Property Model

Fluid Database: AFT Standard

Fluid: Water at 1 atm

Max Fluid Temperature Data= 212 deg. F

Min Fluid Temperature Data= 32 deg. F

Temperature= 40 deg. F

Density= 62.42849 lbm/ft³

Viscosity= 3.74836 lbm/hr-ft

Vapor Pressure= 0.12037 psia

Viscosity Model= Newtonian

Atmospheric Pressure= 1 atm

Gravitational Acceleration= 1 g

Turbulent Flow Above Reynolds Number= 4000

Laminar Flow Below Reynolds Number= 2300

Total Inflow= 1.930E-04 gal/min

Total Outflow= 7.647E-04 gal/min

Maximum Pressure is 54.38 psia at Junction 12 Outlet

Minimum Pressure is 14.30 psia at Junction 12 Inlet

Pump Summary

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Jct	Name	Vol. Flow (gal/min)	Mass Flow (lbm/sec)	dP (psid)	dH (feet)	Overall Efficiency (Percent)	Speed (Percent)	Overall Power (hp)	BEP (gal/min)	% of BEP (Percent)	NPSHA (feet)	NPSHR (feet)
12	Russell Hall Chiller Plant	1,850	257.3	40.08	92.44	100.0	N/A	43.24	N/A	N/A	33.26	15.00

Valve Summary

Jct	Name	Valve Type	Vol. Flow (gal/min)	Mass Flow (lbm/sec)	dP Stag. (psid)	dH (feet)	P Inlet Static (psia)	Cv	K	Valve State
26	Karrmann Library Load	FCV	230.0	31.99	2.19871	5.07163	38.01	155.18	43.1505	Open
27	Karrmann Library Head Loss	PDCV	230.0	31.99	19.94243	46.00000	35.81	51.53	391.3778	Open
58	Center for the Arts Load	FCV	384.0	53.41	0.01655	0.03818	36.85	2,985.84	0.1166	Open
59	Center for the Arts Head Loss	PDCV	384.0	53.41	19.94243	46.00000	36.82	86.03	140.4072	Open
62	Russell Hall/Pioneer Tower Head Loss	PDCV	878.0	122.12	19.94243	46.00000	34.74	196.69	77.1321	Open
63	Russell Hall/Pioneer Tower Load	FCV	878.0	122.12	3.92072	9.04369	38.67	443.61	15.1643	Open
72	Boebel Hall Head Loss	PDCV	358.0	49.79	19.94243	46.00000	35.83	80.20	161.5421	Open
73	Boebel Hall Load	FCV	358.0	49.79	2.02686	4.67524	37.94	251.57	47.1525	Open
81	Russell Hall Chiller Plant Head Loss	PDCV	1,850.0	257.32	15.17359	35.00000	54.12	475.13	63.1671	Open

Pipe Output Table

Pipe	Name	Pipe Nominal Size	Length (feet)	Vol. Flow Rate (gal/min)	Velocity (feet/sec)	dP Stag. Total (ft. H2O std.)	P Stag. In (ft. H2O std. (g))	P Stag. Out (ft. H2O std. (g))	P Static In (ft. H2O std. (g))	P Static Out (ft. H2O std. (g))	dP Static Total (ft. H2O std.)
10	R	12 inch	69.000	972.0	3.137	0.180996	55.9065	55.7255	55.7535	55.5725	0.180996
11	S 12"	12 inch	42.000	972.0	3.137	0.110172	55.7052	55.5950	55.5522	55.4421	0.110172
12	S 12"	12 inch	60.000	972.0	3.137	0.157388	55.5747	55.4173	55.4218	55.2644	0.157388
13	S 12"	12 inch	21.000	972.0	3.137	0.055086	55.3971	55.3420	55.2441	55.1890	0.055086
14	S 12"	12 inch	124.000	972.0	3.137	0.325268	55.3217	54.9964	55.1688	54.8435	0.325268
15	S 12"	12 inch	55.000	972.0	3.137	0.144272	54.9762	54.8319	54.8232	54.6789	0.144272
16	S 12"	12 inch	109.000	972.0	3.137	0.285921	54.7902	54.5043	54.6373	54.3514	0.285921
17	S 12"	12 inch	22.000	972.0	3.137	0.057709	54.4757	54.4180	54.3227	54.2650	0.057709
18	S 12"	12 inch	40.000	614.0	1.982	0.045913	54.4180	54.3721	54.3569	54.3110	0.045913
19	Pipe	12 inch	69.000	972.0	3.137	0.180996	1.0003	0.8193	0.8474	0.6664	0.180996
20	R 12"	12 inch	40.000	614.0	1.982	0.045913	2.3584	2.3125	2.2974	2.2514	0.045913
21	R 12"	12 inch	22.000	972.0	3.137	0.057709	2.3125	2.2548	2.1595	2.1018	0.057709
22	R 12"	12 inch	109.000	972.0	3.137	0.285921	2.2261	1.9402	2.0732	1.7872	0.285921
23	R 12"	12 inch	55.000	972.0	3.137	0.144272	1.8985	1.7543	1.7456	1.6013	0.144272
24	R 12"	12 inch	124.000	972.0	3.137	0.325268	1.7293	1.4041	1.5764	1.2511	0.325268

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Pipe	Name	Pipe Nominal Size	Length (feet)	Vol. Flow Rate (gal/min)	Velocity (feet/sec)	dP Stag. Total (ft. H2O std.)	P Stag. In (ft. H2O std. (g))	P Stag. Out (ft. H2O std. (g))	P Static In (ft. H2O std. (g))	P Static Out (ft. H2O std. (g))	dP Static Total (ft. H2O std.)
25	R 12"	12 inch	21.000	972.0	3.137	0.055086	1.3838	1.3287	1.2308	1.1758	0.055086
26	R 12"	12 inch	42.000	972.0	3.137	0.110172	1.1308	1.0206	0.9778	0.8677	0.110172
27	R 12"	12 inch	60.000	972.0	3.137	0.157388	1.3084	1.1511	1.1555	0.9981	0.157388
28	S 6"	6 inch	22.000	230.0	2.750	0.100324	54.3721	54.2717	54.2545	54.1542	0.100324
29	R 6"	6 inch	22.000	230.0	2.750	0.100323	2.4587	2.3584	2.3412	2.2408	0.100323
30	Pipe	6 inch	35.000	230.0	2.750	0.159607	54.2541	54.0945	54.1366	53.9769	0.159607
31	Pipe	6 inch	35.000	230.0	2.750	0.159607	2.6360	2.4764	2.5184	2.3588	0.159607
32	S 6"	6 inch	38.000	230.0	2.750	0.173288	54.0768	53.9035	53.9593	53.7860	0.173288
33	R 6"	6 inch	38.000	230.0	2.750	0.173288	2.8269	2.6536	2.7094	2.5361	0.173288
35	Pipe	6 inch	1.000	230.0	2.750	0.004560	48.8319	48.8273	48.7143	48.7098	0.004560
37	S 10"	10 inch	209.000	384.0	1.743	0.234334	54.3721	54.1377	54.3248	54.0905	0.234334
38	R 10"	10 inch	209.000	384.0	1.743	0.234334	2.5927	2.3584	2.5455	2.3112	0.234334
39	S 10"	10 inch	87.000	384.0	1.743	0.097546	54.1285	54.0309	54.0812	53.9837	0.097546
40	R 10"	10 inch	87.000	384.0	1.743	0.097546	2.6995	2.6020	2.6523	2.5547	0.097546
41	S 10"	10 inch	172.000	384.0	1.743	0.192849	54.0217	53.8288	53.9744	53.7816	0.192849
42	R 10"	10 inch	172.000	384.0	1.743	0.192849	2.9016	2.7088	2.8544	2.6616	0.192849
50	S 10"	10 inch	64.000	384.0	1.743	0.071758	53.8196	53.7478	53.7723	53.7006	0.071758
52	R 10"	10 inch	64.000	384.0	1.743	0.071758	2.9826	2.9109	2.9354	2.8637	0.071758
53	S 10"	10 inch	30.000	384.0	1.743	0.033637	53.7412	53.7076	53.6940	53.6604	0.033637
54	R 10"	10 inch	30.000	384.0	1.743	0.033637	3.0228	2.9892	2.9756	2.9420	0.033637
56	S 10"	10 inch	48.000	384.0	1.743	0.053818	53.7011	53.6472	53.6538	53.6000	0.053818
57	S 10"	10 inch	20.000	384.0	1.743	0.022424	3.1122	3.0898	3.0650	3.0425	0.022424
59	S 10"	10 inch	162.000	384.0	1.743	0.181637	3.3004	3.1187	3.2531	3.0715	0.181637
60	R 10"	10 inch	162.000	384.0	1.743	0.181637	53.6117	53.4301	53.5645	53.3828	0.181637
61	S 6"	6 inch	116.000	384.0	4.591	1.327270	4.6971	3.3699	4.3695	3.0423	1.327270
62	R 6"	6 inch	116.000	384.0	4.591	1.327270	53.4208	52.0936	53.0932	51.7659	1.327270
63	Pipe	6 inch	1.000	384.0	4.591	0.011442	51.3822	51.3707	51.0546	51.0431	0.011442
64	S 6"	6 inch	50.000	384.0	4.591	0.572099	5.3703	4.7982	5.0427	4.4706	0.572099
65	R 6"	6 inch	50.000	384.0	4.591	0.572099	51.9925	51.4204	51.6648	51.0927	0.572099
66	Pipe	12 inch	70.000	1,850.0	5.971	0.588670	0.8193	0.2307	0.2652	-0.3234	0.588670
69	Pipe	8 inch	1.000	878.0	6.195	0.014321	0.8337	0.8193	0.2373	0.2230	0.014321
70	Pipe	8 inch	1.000	878.0	6.195	0.014322	55.9065	55.8921	55.3101	55.2958	0.014322
71	Pipe	8 inch	1.000	878.0	6.195	0.014322	46.8484	46.8340	46.2520	46.2377	0.014322
72	S 12"	12 inch	183.000	358.0	1.155	0.080010	54.4180	54.3380	54.3972	54.3172	0.080010
73	R 12"	12 inch	183.000	358.0	1.155	0.080009	2.3925	2.3125	2.3717	2.2917	0.080009
74	R 12"	12 inch	10.000	358.0	1.155	0.004372	2.3996	2.3952	2.3789	2.3745	0.004372
75	S 12"	12 inch	10.000	358.0	1.155	0.004372	54.3352	54.3308	54.3145	54.3101	0.004372

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Pipe	Name	Pipe Nominal Size	Length (feet)	Vol. Flow Rate (gal/min)	Velocity (feet/sec)	dP Stag. Total (ft. H2O std.)	P Stag. In (ft. H2O std. (g))	P Stag. Out (ft. H2O std. (g))	P Static In (ft. H2O std. (g))	P Static Out (ft. H2O std. (g))	dP Static Total (ft. H2O std.)
76	R 8"	8 inch	67.000	358.0	2.526	0.190625	2.6099	2.4193	2.5108	2.3202	0.190625
77	S 8"	8 inch	67.000	358.0	2.526	0.190625	54.3270	54.1363	54.2278	54.0372	0.190625
78	R 8"	8 inch	75.000	358.0	2.526	0.213386	2.8373	2.6239	2.7381	2.5247	0.213386
79	S 8"	8 inch	75.000	358.0	2.526	0.213386	54.1224	53.9090	54.0232	53.8098	0.213386
81	S 8"	8 inch	14.000	358.0	2.526	0.039832	53.7558	53.7160	53.6567	53.6169	0.039832
83	S 8"	8 inch	42.000	358.0	2.526	0.119496	53.8950	53.7755	53.7959	53.6764	0.119496
84	R 8"	8 inch	42.000	358.0	2.526	0.119496	2.9707	2.8512	2.8716	2.7521	0.119496
85	R 8"	8 inch	14.000	358.0	2.526	0.039832	3.0303	2.9904	2.9311	2.8913	0.039832
86	Pipe	10 inch	20.000	384.0	1.743	0.022424	53.6407	53.6183	53.5935	53.5710	0.022424
87	Pipe	10 inch	48.000	384.0	1.743	0.053818	3.0832	3.0294	3.0360	2.9822	0.053818
91	Pipe	6 inch	1.000	358.0	4.281	0.010086	49.0407	49.0306	48.7560	48.7459	0.010086
92	Pipe	12 inch	70.000	1,850.0	5.971	0.588669	56.4951	55.9065	55.9410	55.3524	0.588669
93	Pipe	12 inch	60.000	1,850.0	5.971	0.504574	92.0000	91.4954	91.4459	90.9413	0.504574
94	Pipe	12 inch	70.000	1,850.0	5.971	0.588670	0.2307	-0.3580	-0.3234	-0.9121	0.588670
95	Pipe	12 inch	10.000	1,850.0	5.971	0.084096	92.0841	92.0000	91.5300	91.4459	0.084096

All Junction Table

Jct	Name	P Static In (ft. H2O std. (g))	P Static Out (ft. H2O std. (g))	P Stag. In (ft. H2O std. (g))	P Stag. Out (ft. H2O std. (g))	Vol. Flow Rate Thru Jct (gal/min)	dP Stag. Total (ft. H2O std.)	dP Static Total (ft. H2O std.)
3	Bend	0.9981	0.9778	1.1511	1.1308	972.0	0.020276	0.020276
4	Bend	0.8677	0.8474	1.0206	1.0003	972.0	0.020276	0.020276
5	Bend	1.1758	1.1555	1.3287	1.3084	972.0	0.020276	0.020276
6	Bend	1.2511	1.2308	1.4041	1.3838	972.0	0.020276	0.020276
7	Bend	1.6013	1.5764	1.7543	1.7293	972.0	0.024923	0.024923
8	Bend	1.7872	1.7456	1.9402	1.8985	972.0	0.041654	0.041654
9	Bend	2.1018	2.0732	2.2548	2.2261	972.0	0.028641	0.028641
10	Tee or Wye	2.2445	2.2445	2.3125	2.3125	N/A	0.000000	0.000000
11	Tee or Wye	2.2860	2.2860	2.3584	2.3584	N/A	0.000000	0.000000
12	Russell Hall Chiller Plant	-0.9121	91.5300	-0.3580	92.0841	1,850.0	-92.442093	-92.442093
13	Bend	55.5725	55.5522	55.7255	55.7052	972.0	0.020276	0.020276
14	Bend	55.4421	55.4218	55.5950	55.5747	972.0	0.020276	0.020276
15	Bend	55.2644	55.2441	55.4173	55.3971	972.0	0.020276	0.020276
16	Bend	55.1890	55.1688	55.3420	55.3217	972.0	0.020276	0.020276
17	Bend	54.6789	54.6373	54.8319	54.7902	972.0	0.041654	0.041654
18	Bend	54.3514	54.3227	54.5043	54.4757	972.0	0.028641	0.028641

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Jct	Name	P Static In (ft. H2O std. (g))	P Static Out (ft. H2O std. (g))	P Stag. In (ft. H2O std. (g))	P Stag. Out (ft. H2O std. (g))	Vol. Flow Rate Thru Jct (gal/min)	dP Stag. Total (ft. H2O std.)	dP Static Total (ft. H2O std.)
19	Tee or Wye	54.3500	54.3500	54.4180	54.4180	N/A	0.000000	0.000000
20	Tee or Wye	54.2997	54.2997	54.3721	54.3721	N/A	0.000000	0.000000
21	Bend	54.8435	54.8232	54.9964	54.9762	972.0	0.020276	0.020276
22	Bend	54.1542	54.1366	54.2717	54.2541	230.0	0.017654	0.017654
23	Bend	2.3588	2.3412	2.4764	2.4587	230.0	0.017654	0.017654
24	Bend	53.9769	53.9593	54.0945	54.0768	230.0	0.017654	0.017654
25	Bend	2.5361	2.5184	2.6536	2.6360	230.0	0.017654	0.017654
26	Karrmann Library Load	53.7860	48.7143	53.9035	48.8319	230.0	5.071673	5.071673
27	Karrmann Library Head Loss	48.7098	2.7094	48.8273	2.8269	230.0	46.000389	46.000389
28	Bend	2.5547	2.5455	2.6020	2.5927	384.0	0.009256	0.009256
29	Bend	54.0905	54.0812	54.1377	54.1285	384.0	0.009256	0.009256
30	Bend	53.9837	53.9744	54.0309	54.0217	384.0	0.009256	0.009256
31	Bend	2.6616	2.6523	2.7088	2.6995	384.0	0.009256	0.009256
40	Bend	2.9420	2.9354	2.9892	2.9826	384.0	0.006553	0.006553
41	Bend	53.7006	53.6940	53.7478	53.7412	384.0	0.006553	0.006553
42	Bend	53.6604	53.6538	53.7076	53.7011	384.0	0.006553	0.006553
43	Bend	2.9822	2.9756	3.0294	3.0228	384.0	0.006553	0.006553
45	Bend	53.6000	53.5935	53.6472	53.6407	384.0	0.006553	0.006553
52	Bend	53.5710	53.5645	53.6183	53.6117	384.0	0.006553	0.006553
53	Bend	3.0715	3.0650	3.1187	3.1122	384.0	0.006553	0.006553
54	Bend	53.3828	53.0932	53.4301	53.4208	384.0	0.009256	0.289652
55	Bend	3.0423	3.2531	3.3699	3.3004	384.0	0.069511	-0.210884
56	Bend	4.4706	4.3695	4.7982	4.6971	384.0	0.101093	0.101093
57	Bend	51.7659	51.6648	52.0936	51.9925	384.0	0.101093	0.101093
58	Center for the Arts Load	51.0927	51.0546	51.4204	51.3822	384.0	0.038184	0.038184
59	Center for the Arts Head Loss	51.0431	5.0427	51.3707	5.3703	384.0	46.000389	46.000389
60	Branch	0.4150	0.4150	0.8193	0.8193	N/A	0.000000	0.000000
61	Branch	55.5021	55.5021	55.9065	55.9065	N/A	0.000000	0.000000
62	Russell Hall/Pioneer Tower Head Loss	46.2377	0.2373	46.8340	0.8337	878.0	46.000389	46.000389
63	Russell Hall/Pioneer Tower Load	55.2958	46.2520	55.8921	46.8484	878.0	9.043765	9.043765
64	Bend	2.3745	2.3717	2.3952	2.3925	358.0	0.002751	0.002751
65	Bend	54.3172	54.3145	54.3380	54.3352	358.0	0.002751	0.002751
66	Bend	2.3202	2.3789	2.4193	2.3996	358.0	0.019705	-0.058698
67	Bend	54.3101	54.2278	54.3308	54.3270	358.0	0.003885	0.082288
68	Bend	2.5247	2.5108	2.6239	2.6099	358.0	0.013950	0.013950
69	Bend	54.0372	54.0232	54.1363	54.1224	358.0	0.013950	0.013950
70	Bend	2.7521	2.7381	2.8512	2.8373	358.0	0.013950	0.013950

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71	Bend	53.8098	53.7959	53.9090	53.8950	358.0	0.013950	0.013950
72	Boebel Hall Head Loss	48.7459	2.9311	49.0306	3.0303	358.0	46.000389	45.814785
73	Boebel Hall Load	53.6169	48.7560	53.7160	49.0407	358.0	4.675284	4.860890
74	Bend	2.8913	2.8716	2.9904	2.9707	358.0	0.019705	0.019705
75	Bend	53.6764	53.6567	53.7755	53.7558	358.0	0.019705	0.019705
76	Bend	3.0425	3.0360	3.0898	3.0832	384.0	0.006553	0.006553
77	Bend	2.8637	2.8544	2.9109	2.9016	384.0	0.009256	0.009256
78	Bend	53.7816	53.7723	53.8288	53.8196	384.0	0.009256	0.009256
79	Assigned Pressure	91.4459	91.4459	92.0000	92.0000	N/A	0.000000	0.000000
80	Assigned Pressure	-0.3234	-0.3234	0.2307	0.2307	N/A	0.000000	0.000000
81	Russell Hall Chiller Plant Head Loss	90.9413	55.9410	91.4954	56.4951	1,850.0	35.000298	35.000298