

\$(/kW-hr)  
\$0.10

Time to get to 62%  
1 kW-hr = 3,413 Btu's

Revised 20090330

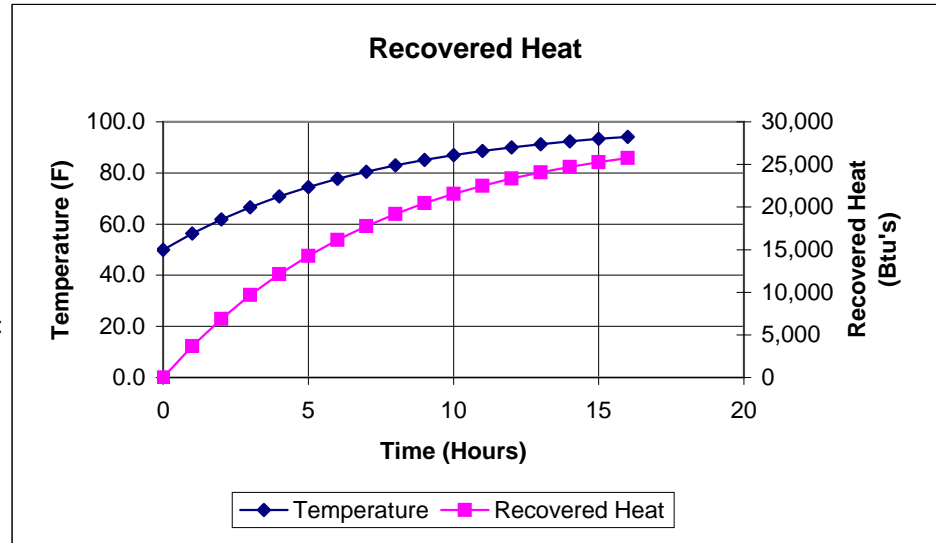
[ ] = individual performance printout

Attic Height	Tamb (F)	TatticPeak (F)	Tube Diam (inches)	No. #	Tu h-outside Btu/(hr-ft^2-F)	k-wall Btu/(hr-ft-F)	Tube Flow (gpm)	h-inside Btu/(hr-ft^2-F)	Flow Type (L or T)	Tfluid (F)	Uoverall Btu/hr*ft^2°F	per LF of 1 Tube Q (Btu/hr)/LF	Size of Tank (gallons)	Total Length Of Tubes (feet)	= Time Constant (hours)	Btu's Recovered (Btu)	Equivalent Electric Energy (kW-hr)	Cycle Electric Energy Cost (\$)
15	80	100	0.5	4	4.598	0.250	2.00	713.22	Turbulent	50	3.74	24.49	70.00	80	14.88	18,076	5.29	\$0.53
15	80	120	0.5	4	5.438	0.250	2.00	713.22	Turbulent	50	4.28	39.21	70.00	80	13.01	25,307	7.41	\$0.74
15	80	140	0.5	4	6.012	0.250	2.00	713.22	Turbulent	50	4.63	54.50	70.00	80	12.04	32,537	9.52	\$0.95
15	80	160	0.5	4	6.464	0.250	2.00	713.22	Turbulent	50	4.89	70.41	70.00	80	11.39	39,767	11.64	\$1.16
15	80	180	0.5	4	6.845	0.250	2.00	713.22	Turbulent	50	5.10	86.86	70.00	80	10.91	46,998	13.76	\$1.38
15	80	200	0.5	4	7.178	0.250	2.00	713.22	Turbulent	50	5.29	103.82	70.00	80	10.53	54,228	15.87	\$1.59
10	80	100	0.5	4	4.184	0.250	2.00	713.22	Turbulent	50	3.46	22.66	70.00	80	16.08	18,076	5.29	\$0.53
10	80	120	0.5	4	4.948	0.250	2.00	713.22	Turbulent	50	3.97	36.37	70.00	80	14.03	25,307	7.41	\$0.74
10	80	140	0.5	4	5.470	0.250	2.00	713.22	Turbulent	50	4.30	50.64	70.00	80	12.95	32,537	9.52	\$0.95
10	80	160	0.5	4	5.882	0.250	2.00	713.22	Turbulent	50	4.55	65.50	70.00	80	12.24	39,767	11.64	\$1.16
10	80	180	0.5	4	6.228	0.250	2.00	713.22	Turbulent	50	4.75	80.89	70.00	80	11.71	46,998	13.76	\$1.38
10	80	200	0.5	4	6.531	0.250	2.00	713.22	Turbulent	50	4.93	96.76	70.00	80	11.30	54,228	15.87	\$1.59
5	80	100	0.5	4	3.560	0.250	2.00	713.22	Turbulent	50	3.02	19.79	70.00	80	18.42	18,076	5.29	\$0.53
5	80	120	0.5	4	4.210	0.250	2.00	713.22	Turbulent	50	3.48	31.89	70.00	80	16.00	25,307	7.41	\$0.74
5	80	140	0.5	4	4.654	0.250	2.00	713.22	Turbulent	50	3.78	44.51	70.00	80	14.74	32,537	9.52	\$0.95
5	80	160	0.5	4	5.004	0.250	2.00	713.22	Turbulent	50	4.01	57.68	70.00	80	13.90	39,767	11.64	\$1.16
5	80	180	0.5	4	5.299	0.250	2.00	713.22	Turbulent	50	4.19	71.34	70.00	80	13.28	46,998	13.76	\$1.38
5	80	200	0.5	4	5.557	0.250	2.00	713.22	Turbulent	50	4.35	85.46	70.00	80	12.79	54,228	15.87	\$1.59
2.5	80	100	0.5	4	3.029	0.250	2.00	713.22	Turbulent	50	2.63	17.23	70.00	80	21.16	18,076	5.29	\$0.53
2.5	80	140	0.5	4	3.960	0.250	2.00	713.22	Turbulent	50	3.31	38.97	70.00	80	16.84	32,537	9.52	\$0.95
2.5	80	180	0.5	4	4.509	0.250	2.00	713.22	Turbulent	50	3.68	62.66	70.00	80	15.12	46,998	13.76	\$1.38

Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

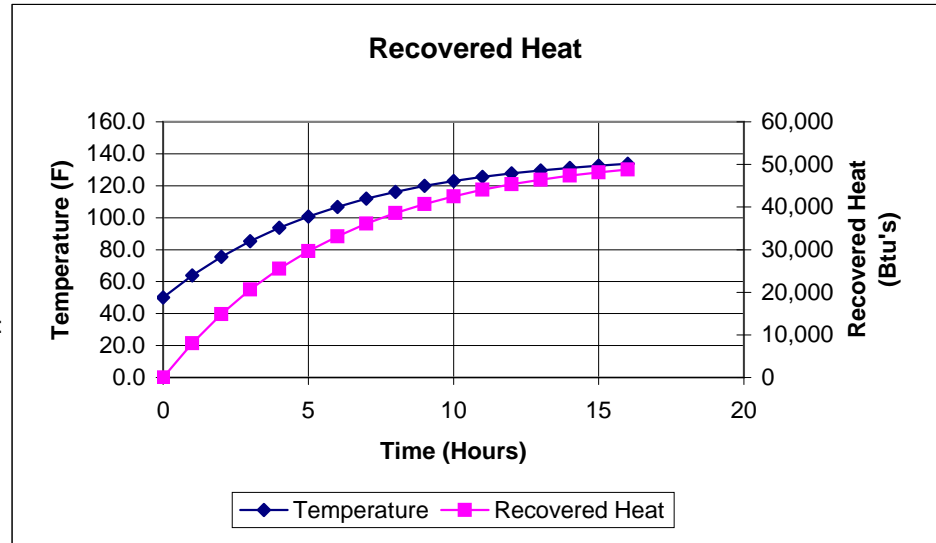
INPUT VARIABLES:							
Attic Peak Height =	15	feet					
Attic Peak Temp. =	100	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)		2 gpm total			
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	3.74	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
Time Constant = 7.4 Hours (Time to attain 62% of attic temperature)			@ 82%	@ 100%			
			Eff. -	Eff. -			
			Fuel	Natural			
			Savings	Gas			
			Oil	Savings			
			(\$)	(\$)			
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	56.3	3,665	1.07	\$0.11	\$0.03	\$0.04	
2	61.8	6,869	2.01	\$0.20	\$0.06	\$0.07	
3	66.6	9,670	2.83	\$0.28	\$0.08	\$0.10	
4	70.8	12,120	3.55	\$0.36	\$0.10	\$0.12	
5	74.5	14,261	4.18	\$0.42	\$0.12	\$0.14	
6	77.7	16,133	4.73	\$0.47	\$0.14	\$0.16	
7	80.5	17,770	5.21	\$0.52	\$0.15	\$0.18	
8	82.9	19,201	5.63	\$0.56	\$0.16	\$0.19	
9	85.1	20,452	5.99	\$0.60	\$0.17	\$0.20	
10	87.0	21,546	6.31	\$0.63	\$0.18	\$0.22	
11	88.6	22,503	6.59	\$0.66	\$0.19	\$0.23	
12	90.0	23,339	6.84	\$0.68	\$0.20	\$0.23	
13	91.3	24,070	7.05	\$0.71	\$0.20	\$0.24	
14	92.4	24,709	7.24	\$0.72	\$0.21	\$0.25	
15	93.3	25,268	7.40	\$0.74	\$0.21	\$0.25	
16	94.2	25,757	7.55	\$0.75	\$0.22	\$0.26	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

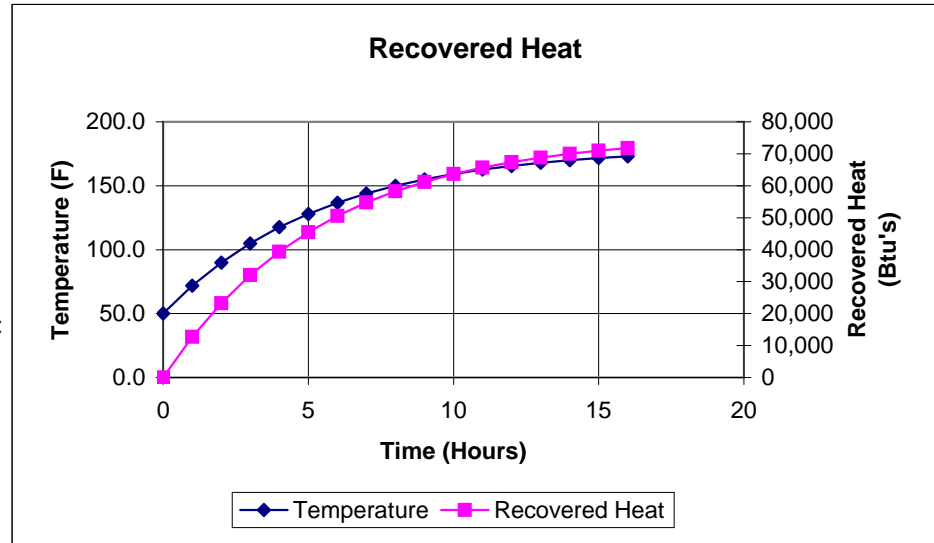
INPUT VARIABLES:							
Attic Peak Height =	15	feet					
Attic Peak Temp. =	140	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)			2	gpm total	
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	4.63	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
Time Constant = 6.0 Hours			@ 82%	@ 100%			
(Time to attain 62% of attic temperature)			Eff. -	Eff. -			
			Fuel	Natural			
			Oil	Gas			
			Savings	Savings			
			(\$)	(\$)			
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	63.8	8,040	2.36	\$0.24	\$0.07	\$0.08	
2	75.5	14,849	4.35	\$0.44	\$0.12	\$0.15	
3	85.4	20,614	6.04	\$0.60	\$0.17	\$0.21	
4	93.7	25,496	7.47	\$0.75	\$0.21	\$0.25	
5	100.8	29,630	8.68	\$0.87	\$0.25	\$0.30	
6	106.8	33,131	9.71	\$0.97	\$0.28	\$0.33	
7	111.9	36,095	10.58	\$1.06	\$0.30	\$0.36	
8	116.2	38,605	11.31	\$1.13	\$0.32	\$0.39	
9	119.9	40,731	11.93	\$1.19	\$0.34	\$0.41	
10	122.9	42,531	12.46	\$1.25	\$0.36	\$0.43	
11	125.6	44,055	12.91	\$1.29	\$0.37	\$0.44	
12	127.8	45,346	13.29	\$1.33	\$0.38	\$0.45	
13	129.6	46,438	13.61	\$1.36	\$0.39	\$0.46	
14	131.2	47,364	13.88	\$1.39	\$0.40	\$0.47	
15	132.6	48,148	14.11	\$1.41	\$0.40	\$0.48	
16	133.7	48,811	14.30	\$1.43	\$0.41	\$0.49	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

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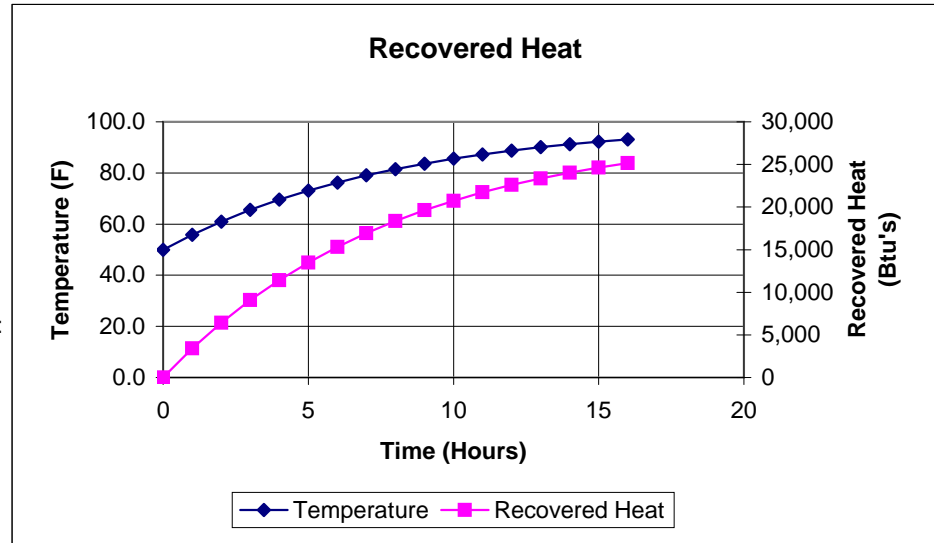
INPUT VARIABLES:							
Attic Peak Height =	15	feet					
Attic Peak Temp. =	180	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)			2	gpm total	
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	5.1	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
			@ 82%	@ 100%			
			Eff. -	Eff. -			
			Fuel	Natural			
			Oil	Gas			
			Savings	Savings			
			(\$)	(\$)			
Time Constant =	5.5	Hours					
(Time to attain 62% of attic temperature)							
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	71.8	12,688	3.72	\$0.37	\$0.11	\$0.13	
2	89.9	23,253	6.81	\$0.68	\$0.20	\$0.23	
3	105.0	32,049	9.39	\$0.94	\$0.27	\$0.32	
4	117.5	39,373	11.54	\$1.15	\$0.33	\$0.39	
5	128.0	45,470	13.32	\$1.33	\$0.38	\$0.45	
6	136.7	50,548	14.81	\$1.48	\$0.42	\$0.51	
7	143.9	54,775	16.05	\$1.60	\$0.46	\$0.55	
8	150.0	58,295	17.08	\$1.71	\$0.49	\$0.58	
9	155.0	61,225	17.94	\$1.79	\$0.51	\$0.61	
10	159.2	63,665	18.65	\$1.87	\$0.54	\$0.64	
11	162.7	65,697	19.25	\$1.92	\$0.55	\$0.66	
12	165.6	67,389	19.74	\$1.97	\$0.57	\$0.67	
13	168.0	68,797	20.16	\$2.02	\$0.58	\$0.69	
14	170.0	69,970	20.50	\$2.05	\$0.59	\$0.70	
15	171.7	70,946	20.79	\$2.08	\$0.60	\$0.71	
16	173.1	71,759	21.03	\$2.10	\$0.60	\$0.72	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

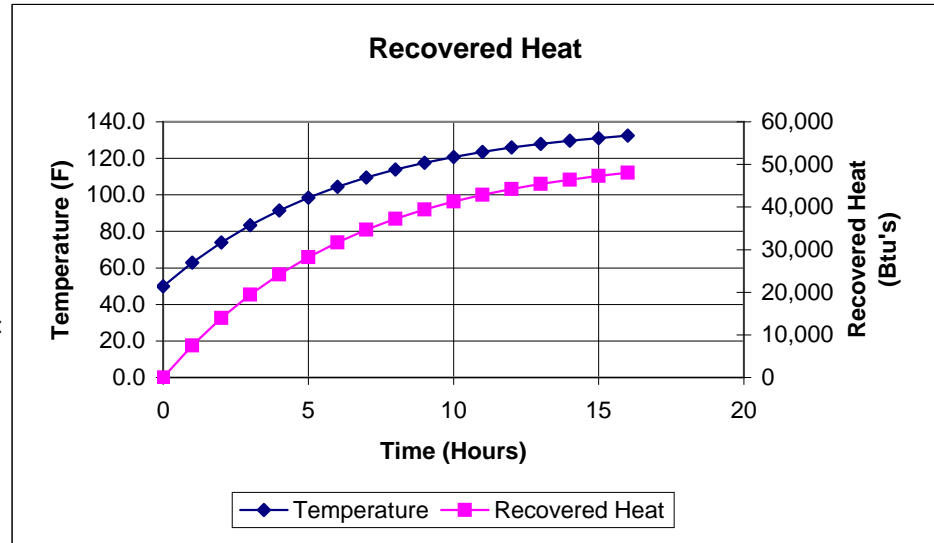
INPUT VARIABLES:							
Attic Peak Height =	10	feet					
Attic Peak Temp. =	100	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)			2 gpm total		
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	3.46	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
Time Constant = 8.0 Hours			@ 82%	@ 100%			
(Time to attain 62% of attic temperature)			Eff. -	Eff. -			
			Fuel	Natural			
			Oil	Gas			
			Savings	Savings			
			(\$)	(\$)			
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	55.8	3,407	1.00	\$0.10	\$0.03	\$0.03	
2	61.0	6,416	1.88	\$0.19	\$0.05	\$0.06	
3	65.6	9,074	2.66	\$0.27	\$0.08	\$0.09	
4	69.6	11,420	3.35	\$0.33	\$0.10	\$0.11	
5	73.1	13,493	3.95	\$0.40	\$0.11	\$0.13	
6	76.3	15,323	4.49	\$0.45	\$0.13	\$0.15	
7	79.1	16,940	4.96	\$0.50	\$0.14	\$0.17	
8	81.5	18,367	5.38	\$0.54	\$0.15	\$0.18	
9	83.7	19,628	5.75	\$0.58	\$0.16	\$0.20	
10	85.6	20,741	6.08	\$0.61	\$0.17	\$0.21	
11	87.3	21,725	6.37	\$0.64	\$0.18	\$0.22	
12	88.7	22,593	6.62	\$0.66	\$0.19	\$0.23	
13	90.1	23,360	6.84	\$0.68	\$0.20	\$0.23	
14	91.2	24,037	7.04	\$0.70	\$0.20	\$0.24	
15	92.2	24,635	7.22	\$0.72	\$0.21	\$0.25	
16	93.2	25,163	7.37	\$0.74	\$0.21	\$0.25	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

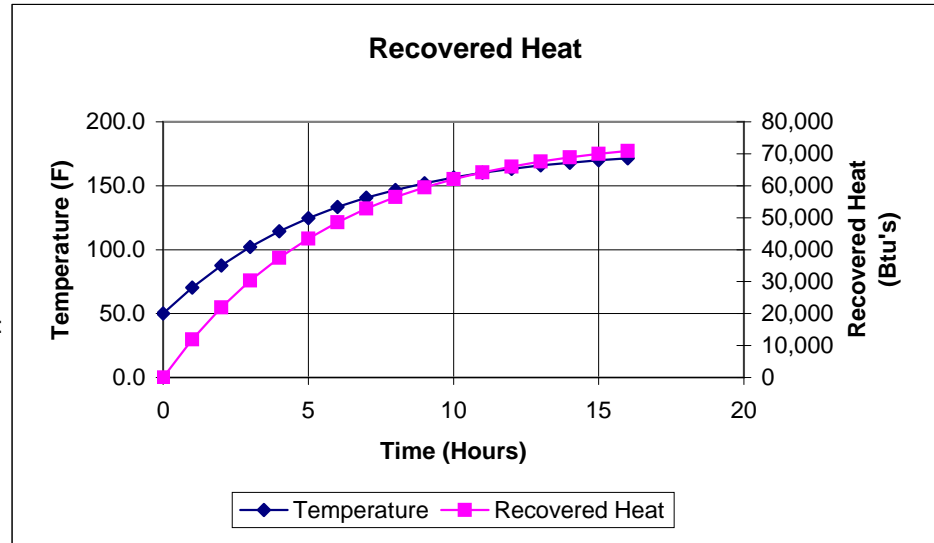
INPUT VARIABLES:						
Attic Peak Height =	10	feet				
Attic Peak Temp. =	140	degF				
Number of Tubes =	4	nd				
Tube OD =	0.5	inches				
Tube ID =	0.375	inches				
Cap Length (4 tubes)=	40	ft				
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow		
Fluid Flow =	1	gpm (per tube)		2 gpm total		
Fluid Initial Temp. =	50	degF				
OA Heat Xfer Coeff =	4.3	Btu/(hr*ft^2*F)				
Storage Tank Size =	70	gallons				
Cost per kW-Hr =	\$0.10	US dollars				
Cost/Gal #2 Oil =	\$1.00	US dollars				
Cost/CCF Nat. Gas =	\$1.00	US dollars				
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:		
			1 kW-hr =	1 CF gas=		
			3,413	1,000		
			Btu's	Btu's		
			@ 82%	@ 100%		
			Eff. -	Eff. -		
			Fuel	Natural		
			Savings	Gas		
			Oil	Savings		
			Savings	(\$)		
			(\$)	(\$)		
			(\$)	(\$)		
Time Constant =	6.5	Hours				
(Time to attain 62% of attic temperature)						
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Savings (\$)	Natural Gas Savings (\$)
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00
1	62.9	7,510	2.20	\$0.22	\$0.06	\$0.08
2	73.9	13,946	4.09	\$0.41	\$0.12	\$0.14
3	83.4	19,461	5.70	\$0.57	\$0.16	\$0.19
4	91.5	24,186	7.09	\$0.71	\$0.20	\$0.24
5	98.4	28,235	8.27	\$0.83	\$0.24	\$0.28
6	104.4	31,705	9.29	\$0.93	\$0.27	\$0.32
7	109.5	34,678	10.16	\$1.02	\$0.29	\$0.35
8	113.8	37,225	10.91	\$1.09	\$0.31	\$0.37
9	117.6	39,408	11.55	\$1.15	\$0.33	\$0.39
10	120.8	41,279	12.09	\$1.21	\$0.35	\$0.41
11	123.5	42,882	12.56	\$1.26	\$0.36	\$0.43
12	125.9	44,255	12.97	\$1.30	\$0.37	\$0.44
13	127.9	45,432	13.31	\$1.33	\$0.38	\$0.45
14	129.6	46,441	13.61	\$1.36	\$0.39	\$0.46
15	131.1	47,305	13.86	\$1.39	\$0.40	\$0.47
16	132.4	48,045	14.08	\$1.41	\$0.40	\$0.48



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

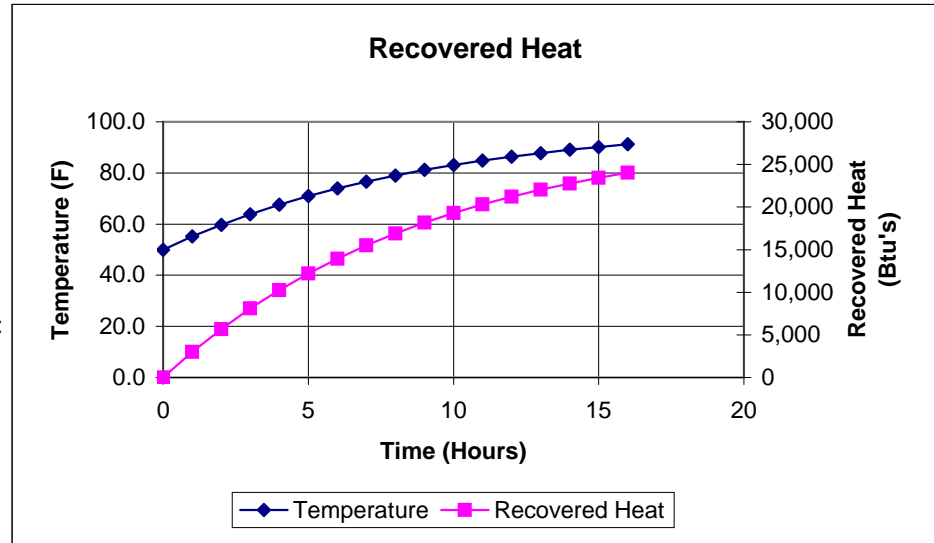
INPUT VARIABLES:							
Attic Peak Height =	10	feet					
Attic Peak Temp. =	180	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)			2 gpm total		
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	4.75	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
Time Constant = 5.9 Hours			@ 82%	@ 100%			
(Time to attain 62% of attic temperature)			Eff. -	Eff. -			
			Fuel	Natural			
			Oil	Gas			
			Savings	Savings			
			(\$)	(\$)			
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	70.4	11,890	3.48	\$0.35	\$0.10	\$0.12	
2	87.6	21,915	6.42	\$0.64	\$0.18	\$0.22	
3	102.1	30,367	8.90	\$0.89	\$0.26	\$0.30	
4	114.3	37,494	10.99	\$1.10	\$0.32	\$0.37	
5	124.6	43,503	12.75	\$1.27	\$0.37	\$0.44	
6	133.3	48,569	14.23	\$1.42	\$0.41	\$0.49	
7	140.6	52,841	15.48	\$1.55	\$0.44	\$0.53	
8	146.8	56,442	16.54	\$1.65	\$0.47	\$0.56	
9	152.0	59,479	17.43	\$1.74	\$0.50	\$0.59	
10	156.4	62,040	18.18	\$1.82	\$0.52	\$0.62	
11	160.1	64,198	18.81	\$1.88	\$0.54	\$0.64	
12	163.2	66,019	19.34	\$1.93	\$0.55	\$0.66	
13	165.9	67,553	19.79	\$1.98	\$0.57	\$0.68	
14	168.1	68,847	20.17	\$2.02	\$0.58	\$0.69	
15	169.9	69,938	20.49	\$2.05	\$0.59	\$0.70	
16	171.5	70,858	20.76	\$2.08	\$0.60	\$0.71	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

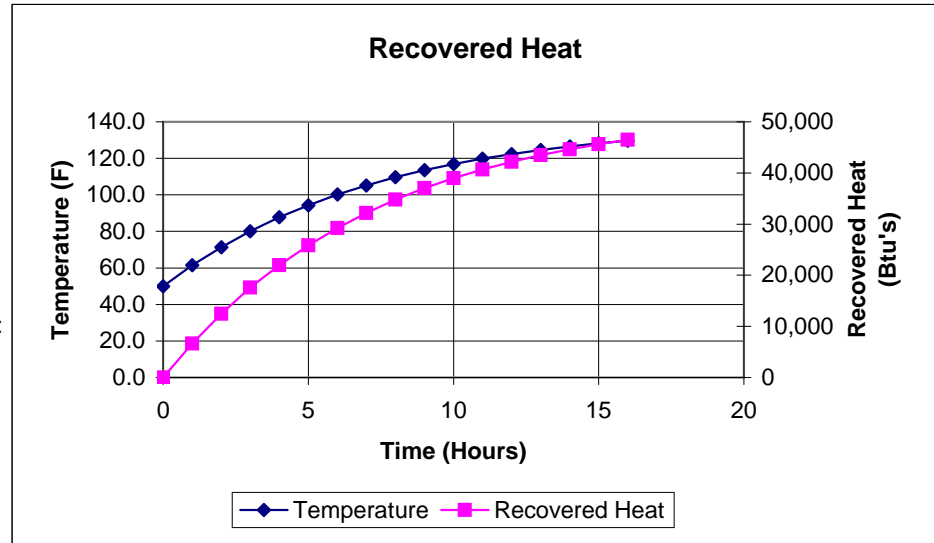
INPUT VARIABLES:							
Attic Peak Height =	5 feet						
Attic Peak Temp. =	100 degF						
Number of Tubes =	4 nd						
Tube OD =	0.5 inches						
Tube ID =	0.375 inches						
Cap Length (4 tubes)=	40 ft						
Tube OD Area (*) =	20.94 square ft	total for L	serpentine flow				
Fluid Flow =	1 gpm (per tube)					2 gpm total	
Fluid Initial Temp. =	50 degF						
OA Heat Xfer Coeff =	3.02 Btu/(hr*ft^2*F)						
Storage Tank Size =	70 gallons						
Cost per kW-Hr =	\$0.10 US dollars						
Cost/Gal #2 Oil =	\$1.00 US dollars						
Cost/CCF Nat. Gas =	\$1.00 US dollars						
(*) Note: is SF of length of all tubes in the cap				Conversion:	Conversion:		
				1 kW-hr =	1 CF gas=		
				3,413	1,000		
				Btu's	Btu's		
Time Constant = 9.2 Hours (Time to attain 62% of attic temperature)				@ 82% Eff. -	@ 100% Eff. -		
				Fuel Oil Savings (\$)	Natural Gas Savings (\$)		
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	55.1	2,997	0.88	\$0.09	\$0.03	\$0.03	
2	59.8	5,686	1.67	\$0.17	\$0.05	\$0.06	
3	63.9	8,099	2.37	\$0.24	\$0.07	\$0.08	
4	67.6	10,263	3.01	\$0.30	\$0.09	\$0.10	
5	70.9	12,205	3.58	\$0.36	\$0.10	\$0.12	
6	73.9	13,948	4.09	\$0.41	\$0.12	\$0.14	
7	76.6	15,511	4.54	\$0.45	\$0.13	\$0.16	
8	79.0	16,913	4.96	\$0.50	\$0.14	\$0.17	
9	81.2	18,172	5.32	\$0.53	\$0.15	\$0.18	
10	83.1	19,301	5.66	\$0.57	\$0.16	\$0.19	
11	84.8	20,314	5.95	\$0.60	\$0.17	\$0.20	
12	86.4	21,223	6.22	\$0.62	\$0.18	\$0.21	
13	87.8	22,038	6.46	\$0.65	\$0.19	\$0.22	
14	89.0	22,770	6.67	\$0.67	\$0.19	\$0.23	
15	90.2	23,426	6.86	\$0.69	\$0.20	\$0.23	
16	91.2	24,015	7.04	\$0.70	\$0.20	\$0.24	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

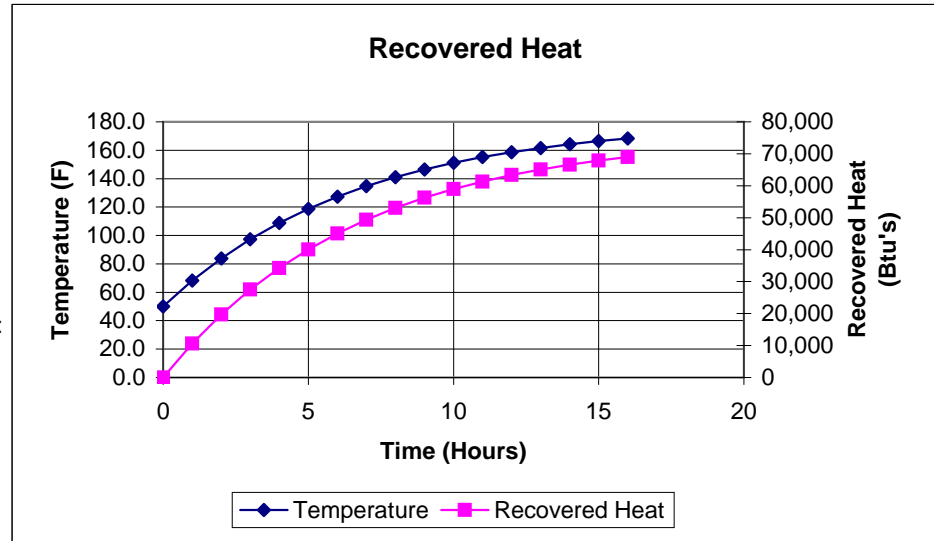
INPUT VARIABLES:							
Attic Peak Height =	5 feet						
Attic Peak Temp. =	140 degF						
Number of Tubes =	4 nd						
Tube OD =	0.5 inches						
Tube ID =	0.375 inches						
Cap Length (4 tubes)=	40 ft						
Tube OD Area (*) =	20.94 square ft	total for L	serpentine flow				
Fluid Flow =	1 gpm (per tube)					2 gpm total	
Fluid Initial Temp. =	50 degF						
OA Heat Xfer Coeff =	3.78 Btu/(hr*ft^2*F)						
Storage Tank Size =	70 gallons						
Cost per kW-Hr =	\$0.10 US dollars						
Cost/Gal #2 Oil =	\$1.00 US dollars						
Cost/CCF Nat. Gas =	\$1.00 US dollars						
(*) Note: is SF of length of all tubes in the cap				Conversion:	Conversion:		
				1 kW-hr =	1 CF gas=		
				3,413	1,000		
				Btu's	Btu's		
Time Constant = 7.4 Hours (Time to attain 62% of attic temperature)				@ 82%	@ 100%		
				Eff. -	Eff. -		
				Fuel	Natural		
				Oil	Gas		
				Savings	Savings		
				(\$)	(\$)		
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	61.4	6,663	1.95	\$0.20	\$0.06	\$0.07	
2	71.4	12,479	3.66	\$0.37	\$0.10	\$0.12	
3	80.1	17,558	5.14	\$0.51	\$0.15	\$0.18	
4	87.7	21,991	6.44	\$0.64	\$0.18	\$0.22	
5	94.4	25,862	7.58	\$0.76	\$0.22	\$0.26	
6	100.1	29,241	8.57	\$0.86	\$0.25	\$0.29	
7	105.2	32,191	9.43	\$0.94	\$0.27	\$0.32	
8	109.6	34,767	10.19	\$1.02	\$0.29	\$0.35	
9	113.5	37,016	10.85	\$1.08	\$0.31	\$0.37	
10	116.8	38,979	11.42	\$1.14	\$0.33	\$0.39	
11	119.8	40,693	11.92	\$1.19	\$0.34	\$0.41	
12	122.4	42,189	12.36	\$1.24	\$0.35	\$0.42	
13	124.6	43,496	12.74	\$1.27	\$0.37	\$0.43	
14	126.5	44,636	13.08	\$1.31	\$0.38	\$0.45	
15	128.3	45,632	13.37	\$1.34	\$0.38	\$0.46	
16	129.7	46,501	13.62	\$1.36	\$0.39	\$0.47	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

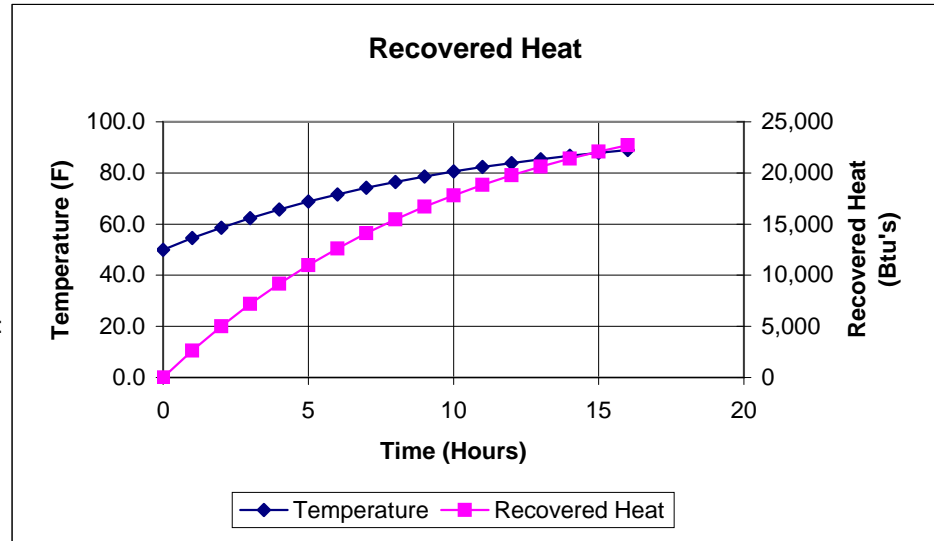
INPUT VARIABLES:							
Attic Peak Height =	5 feet						
Attic Peak Temp. =	180 degF						
Number of Tubes =	4 nd						
Tube OD =	0.5 inches						
Tube ID =	0.375 inches						
Cap Length (4 tubes)=	40 ft						
Tube OD Area (*) =	20.94 square ft	total for L	serpentine flow				
Fluid Flow =	1 gpm (per tube)					2 gpm total	
Fluid Initial Temp. =	50 degF						
OA Heat Xfer Coeff =	4.19 Btu/(hr*ft^2*F)						
Storage Tank Size =	70 gallons						
Cost per kW-Hr =	\$0.10 US dollars						
Cost/Gal #2 Oil =	\$1.00 US dollars						
Cost/CCF Nat. Gas =	\$1.00 US dollars						
(*) Note: is SF of length of all tubes in the cap				Conversion:	Conversion:		
				1 kW-hr =	1 CF gas=		
				3,413	1,000		
				Btu's	Btu's		
Time Constant = 6.6 Hours (Time to attain 62% of attic temperature)				@ 82% Eff. -	@ 100% Eff. -		
				Fuel Oil Savings (\$)	Natural Gas Savings (\$)		
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	68.2	10,591	3.10	\$0.31	\$0.09	\$0.11	
2	83.8	19,703	5.77	\$0.58	\$0.17	\$0.20	
3	97.2	27,541	8.07	\$0.81	\$0.23	\$0.28	
4	108.8	34,284	10.05	\$1.00	\$0.29	\$0.34	
5	118.7	40,085	11.74	\$1.17	\$0.34	\$0.40	
6	127.3	45,076	13.21	\$1.32	\$0.38	\$0.45	
7	134.7	49,369	14.46	\$1.45	\$0.41	\$0.49	
8	141.0	53,062	15.55	\$1.55	\$0.45	\$0.53	
9	146.4	56,240	16.48	\$1.65	\$0.47	\$0.56	
10	151.1	58,973	17.28	\$1.73	\$0.50	\$0.59	
11	155.2	61,325	17.97	\$1.80	\$0.52	\$0.61	
12	158.6	63,347	18.56	\$1.86	\$0.53	\$0.63	
13	161.6	65,088	19.07	\$1.91	\$0.55	\$0.65	
14	164.2	66,585	19.51	\$1.95	\$0.56	\$0.67	
15	166.4	67,873	19.89	\$1.99	\$0.57	\$0.68	
16	168.3	68,981	20.21	\$2.02	\$0.58	\$0.69	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

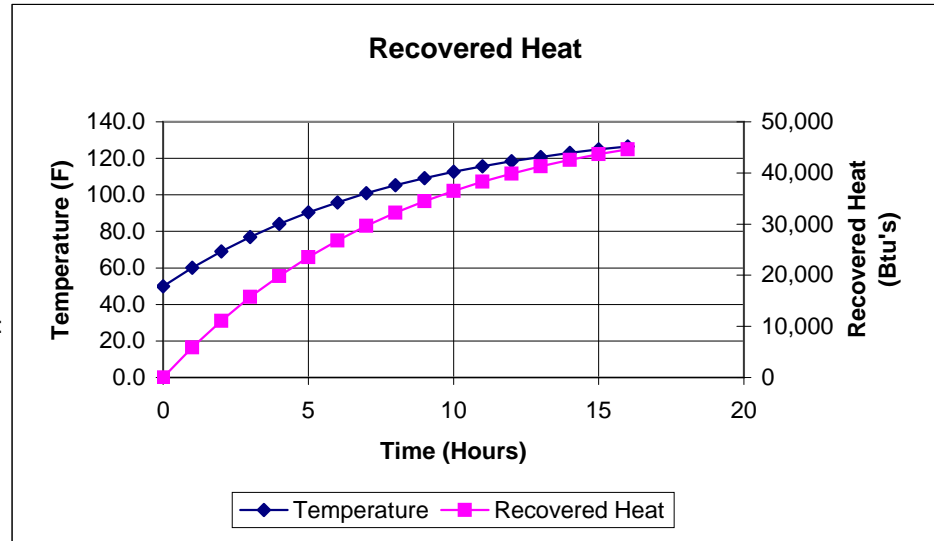
INPUT VARIABLES:							
Attic Peak Height =	2.5	feet					
Attic Peak Temp. =	100	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)			2 gpm total		
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	2.63	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
Time Constant = 10.6 Hours (Time to attain 62% of attic temperature)			@ 82%	@ 100%			
			Eff. -	Eff. -			
			Fuel	Natural			
			Savings	Gas			
			Oil	Savings			
			Savings	(\$)			
			(\$)	(\$)			
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	54.5	2,628	0.77	\$0.08	\$0.02	\$0.03	
2	58.6	5,019	1.47	\$0.15	\$0.04	\$0.05	
3	62.3	7,195	2.11	\$0.21	\$0.06	\$0.07	
4	65.7	9,174	2.69	\$0.27	\$0.08	\$0.09	
5	68.8	10,975	3.22	\$0.32	\$0.09	\$0.11	
6	71.6	12,614	3.70	\$0.37	\$0.11	\$0.13	
7	74.2	14,105	4.13	\$0.41	\$0.12	\$0.14	
8	76.5	15,462	4.53	\$0.45	\$0.13	\$0.15	
9	78.6	16,696	4.89	\$0.49	\$0.14	\$0.17	
10	80.6	17,819	5.22	\$0.52	\$0.15	\$0.18	
11	82.3	18,841	5.52	\$0.55	\$0.16	\$0.19	
12	83.9	19,771	5.79	\$0.58	\$0.17	\$0.20	
13	85.4	20,617	6.04	\$0.60	\$0.17	\$0.21	
14	86.7	21,386	6.27	\$0.63	\$0.18	\$0.21	
15	87.9	22,086	6.47	\$0.65	\$0.19	\$0.22	
16	89.0	22,724	6.66	\$0.67	\$0.19	\$0.23	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

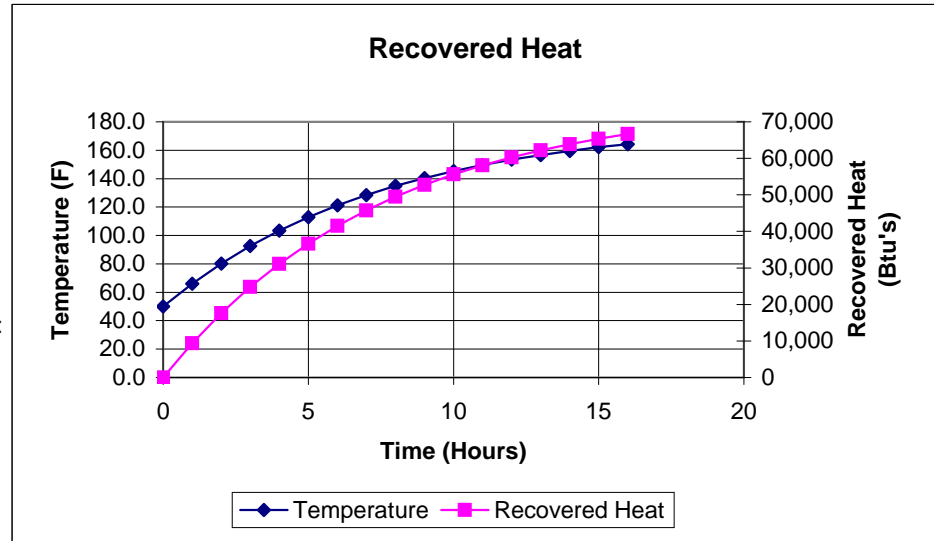
INPUT VARIABLES:							
Attic Peak Height =	2.5	feet					
Attic Peak Temp. =	140	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)			2 gpm total		
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	3.31	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
Time Constant = 8.4 Hours			@ 82%	@ 100%			
(Time to attain 62% of attic temperature)			Eff. -	Eff. -			
			Fuel	Natural			
			Oil	Gas			
			Savings	Savings			
			(\$)	(\$)			
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	60.1	5,883	1.72	\$0.17	\$0.05	\$0.06	
2	69.0	11,106	3.25	\$0.33	\$0.09	\$0.11	
3	77.0	15,743	4.61	\$0.46	\$0.13	\$0.16	
4	84.1	19,861	5.82	\$0.58	\$0.17	\$0.20	
5	90.3	23,518	6.89	\$0.69	\$0.20	\$0.24	
6	95.9	26,764	7.84	\$0.78	\$0.22	\$0.27	
7	100.8	29,646	8.69	\$0.87	\$0.25	\$0.30	
8	105.2	32,206	9.44	\$0.94	\$0.27	\$0.32	
9	109.1	34,478	10.10	\$1.01	\$0.29	\$0.34	
10	112.6	36,496	10.69	\$1.07	\$0.31	\$0.36	
11	115.7	38,288	11.22	\$1.12	\$0.32	\$0.38	
12	118.4	39,878	11.68	\$1.17	\$0.34	\$0.40	
13	120.8	41,291	12.10	\$1.21	\$0.35	\$0.41	
14	123.0	42,545	12.47	\$1.25	\$0.36	\$0.43	
15	124.9	43,659	12.79	\$1.28	\$0.37	\$0.44	
16	126.6	44,647	13.08	\$1.31	\$0.38	\$0.45	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.

INPUT VARIABLES:							
Attic Peak Height =	2.5	feet					
Attic Peak Temp. =	180	degF					
Number of Tubes =	4	nd					
Tube OD =	0.5	inches					
Tube ID =	0.375	inches					
Cap Length (4 tubes)=	40	ft					
Tube OD Area (*) =	20.94	square ft	total for L	serpentine flow			
Fluid Flow =	1	gpm (per tube)			2 gpm total		
Fluid Initial Temp. =	50	degF					
OA Heat Xfer Coeff =	3.68	Btu/(hr*ft^2*F)					
Storage Tank Size =	70	gallons					
Cost per kW-Hr =	\$0.10	US dollars					
Cost/Gal #2 Oil =	\$1.00	US dollars					
Cost/CCF Nat. Gas =	\$1.00	US dollars					
(*) Note: is SF of length of all tubes in the cap			Conversion:	Conversion:			
			1 kW-hr =	1 CF gas=			
			3,413	1,000			
			Btu's	Btu's			
Time Constant = 7.6 Hours			@ 82%	@ 100%			
(Time to attain 62% of attic temperature)			Eff. -	Eff. -			
			Fuel	Natural			
			Oil	Gas			
			Savings	Savings			
			(\$)	(\$)			
t (hrs)	T tank degF	Btu's Stored	Equivalent Electrical Energy (kW-Hr)	Electrical Energy Savings (\$)	Fuel Oil Savings (\$)	Natural Gas Savings (\$)	
0	50.0	0	0.00	\$0.00	\$0.00	\$0.00	
1	66.1	9,386	2.75	\$0.27	\$0.08	\$0.09	
2	80.2	17,609	5.16	\$0.52	\$0.15	\$0.18	
3	92.6	24,815	7.27	\$0.73	\$0.21	\$0.25	
4	103.4	31,128	9.12	\$0.91	\$0.26	\$0.31	
5	112.9	36,659	10.74	\$1.07	\$0.31	\$0.37	
6	121.2	41,506	12.16	\$1.22	\$0.35	\$0.42	
7	128.5	45,752	13.41	\$1.34	\$0.38	\$0.46	
8	134.8	49,473	14.50	\$1.45	\$0.42	\$0.49	
9	140.4	52,733	15.45	\$1.55	\$0.44	\$0.53	
10	145.3	55,590	16.29	\$1.63	\$0.47	\$0.56	
11	149.6	58,092	17.02	\$1.70	\$0.49	\$0.58	
12	153.4	60,285	17.66	\$1.77	\$0.51	\$0.60	
13	156.7	62,207	18.23	\$1.82	\$0.52	\$0.62	
14	159.6	63,890	18.72	\$1.87	\$0.54	\$0.64	
15	162.1	65,365	19.15	\$1.92	\$0.55	\$0.65	
16	164.3	66,657	19.53	\$1.95	\$0.56	\$0.67	



Analysis assumes ideal conditions regarding geometry of installation, attic space draft, air flow rate and temperatures, and performance of piping and storage tank.

A testing program should be initiated to refine the results of the analytical model.