

Apéndice E Resultados de la corrida del sistema 1.2.2

Tratamiento térmico aplicado a agua con flujo alto, recirculando durante 90 minutos. El producto se llevó y se mantuvo a temperaturas entre los 71°C y los 74°C.

Temperatura										
Termopar	1	2	3	4	5	6	7	10	11	12
Tiempo (m)										
0	72.4	68.7	38.0	60.8	63	69.8	44.8	41.3	36.1	42.4
5	74	70.4	40.6	62.4	64.9	71.6	47.3	44.5	40.4	45.4
10	75.2	71.8	43.7	63.9	66.7	72.9	49.9	46.3	40.8	47.3
15	74.1	71.1	45.9	64.2	66.6	72.1	51.4	49	44.7	49.0
20	73.1	70.5	47.9	63.9	66.4	71.3	52.8	50.1	45.6	50.5
25	73.3	70.5	48.7	64.1	66.6	71.7	53.8	51.5	47.7	51.8
30	73.1	70.6	50.2	64.6	66.9	71.6	54.9	51.9	48.1	53.5
35	73	70.3	50.4	64.2	66.7	71.5	55.2	52.9	49.3	53.4
40	72.5	69.9	51.2	64.1	66.4	71	55.5	53.2	48.7	52.8
45	73.1	70.6	51.3	64.3	66.9	71.6	56	52.7	48.4	54.3
50	73.9	71.4	51.7	65.1	67.7	72.4	56.4	53.3	49.6	55.2
55	74.2	71.7	52.3	66.6	68.2	72.8	56.9	54.1	51.2	56.2
60	72.9	70.6	52.7	64.6	67.2	71.4	56.9	53.9	49.6	55.0
65	73.8	71.4	52.8	65.5	67.9	72.3	57.2	54.8	51.5	55.8
70	74	71.7	52.7	65.7	68.2	72.5	57.5	54.8	50.2	55.1
75	73.6	71.2	52.9	65.6	68	72.2	57.6	54.9	51.1	56.0
80	73.2	70.9	52.8	65.4	67.8	71.8	57.6	55.3	51.9	56.0
85	72.9	70.6	52.9	65.1	67.5	71.5	57.6	54.8	50.2	55.2
90	72.1	69.9	52.7	64.6	66.9	70.8	57.3	55.1	51.9	55.9

Tablas del Análisis del Calentador

Fluido Caliente	
Flujo (ml/s)	245.758
Densidad (kg/m ³)	976.614
Viscosidad (Kg/ms)	0.0003952
Cp _{cal} (KJ/kgK)	4.1934

Fluido Frio	
Flujo (ml/s)	132.682
Densidad (kg/m ³)	978.849
Viscosidad (Kg/ms)	0.0004174
Cp _{frio} (KJ/Kg K)	4.191

	Flujo Caliente	Flujo Frio
ml/s	245.758	132.682
m ³ /s	0.000245758	0.000132682
m/s	0.075851235	0.049141481
kg/m	14.401	7.793

Reynolds Caliente	1124.657
Reynolds frio	691.453

jh _{cal}	36.678
Pr _{cal}	2.7374
kcal (W/mK)	0.6672
jh _{frio}	26.567
Pr _{frio}	2.7968
kfrio (W/mK)	0.6651

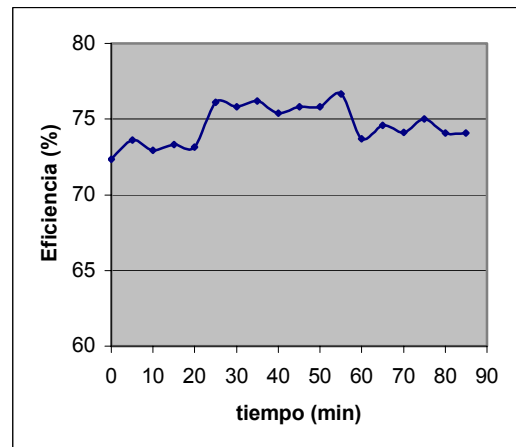
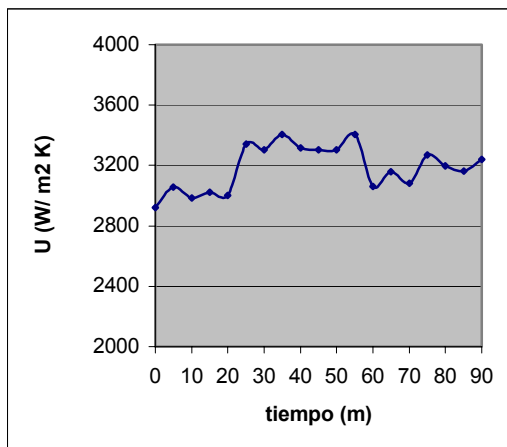
Nu _{cal}	51.136
Nu _{frio}	37.303
h _{cal}	5685.901
h _{frio}	4134.926
Ut (W/m ² K)	2207.457

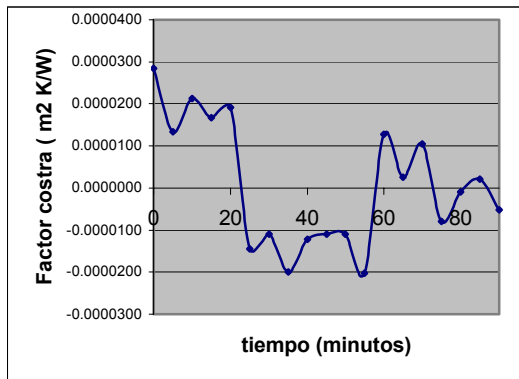
Area del Calentador (m ²)	0.32
Numero de canales	5
Area de placa (m ²)	0.00054
D equivalente (m)	0.006
Ch	0.348
y	0.663

U limpio	W / m ² K	3186.60	tiempo de incrustación	min	55	factor costra	m ² K / W	6.79698E-07
----------	----------------------	---------	------------------------	-----	----	---------------	----------------------	-------------

minutos	KJ/s			W /K m2	%	m2 K/W
Tiempo	Q cal	Q frio	DT ml	U	U	factor costra
0	-3.701	3.701	3.958	2922.260	72.34	0.0000284
5	-3.647	3.647	3.729	3056.049	73.63	0.0000134
10	-3.375	3.375	3.534	2983.779	72.94	0.0000213
15	-2.994	2.994	3.093	3024.860	73.33	0.0000168
20	-2.667	2.667	2.775	3003.920	73.13	0.0000191
25	-2.776	2.776	2.597	3339.944	76.12	-0.0000144
30	-2.558	2.558	2.421	3302.357	75.81	-0.0000110
35	-2.717	2.613	2.399	3403.753	76.19	-0.0000200
40	-2.617	2.504	2.360	3314.815	75.41	-0.0000121
45	-2.558	2.558	2.421	3302.357	75.81	-0.0000110
50	-2.558	2.558	2.421	3302.357	75.81	-0.0000110
55	-2.504	2.504	2.296	3407.140	76.67	-0.0000203
60	-2.286	2.286	2.333	3062.256	73.68	0.0000127
65	-2.395	2.395	2.368	3160.172	74.58	0.0000026
70	-2.286	2.341	2.371	3084.274	74.14	0.0000104
75	-2.395	2.286	2.185	3269.151	75.00	-0.0000079
80	-2.340	2.177	2.129	3196.384	74.07	-0.0000010
85	-2.286	2.177	2.150	3165.016	74.07	0.0000021
90	-2.177	2.123	2.047	3240.651	75.00	-0.0000052
					Promedio	0.0000007

Gráficos del Análisis del Calentador





Tablas del análisis del regenerador

Fluido Caliente	
Flujo (ml/s)	132.682
Densidad (kg/m3)	981.537
Viscosidad (Kg/ms)	0.0004488
Cpcal (KJ/kgK)	4.191

Fluido Frio	
Flujo (ml/s)	132.682
Densidad (kg/m3)	984.377
Viscosidad (Kg/ms)	0.00048332
Cpfrio (KJ/kgK)	4.186058

	Flujo Caliente	Flujo Frio
ml/s	132.682	132.682
m3/s	0.0001327	0.0001327
m/s	0.0307134	0.0307134
kg/s	7.8139375	7.8365465

Reynolds Caliente	403.026
Reynolds frio	375.324

jhcal	18.574
Prcal	2.9292
kcal (W/mK)	0.6604
jhfrío	17.718
Prfrío	3.108
kfrío (W/mK)	0.655965

Nucal	26.48149
Nufrío	25.75902
hcal	2914.729
hfrío	2816.169
Ut (W/m2K)	1363.37955

Area del Recuperador (m2)	0.48
Numero de canales	8
Area de placa (m2)	0.00054
D equivalente (m)	0.006
Ch	0.348
y	0.663

U limpio	W/ m2 K	4232.39	tiempo de incrustación	min	20	factor costra	m2 K / W	1.4932E-05
----------	---------	---------	------------------------	-----	----	---------------	----------	------------

minutos	KJ/s			W /K m2	%	m2 K/W
Tiempo	Qcal	Qfrio	DTml	U	Eficiencia	factor costra
0	-13.645	13.646	6.779	4193.527	78.59	2.1895E-06
5	-13.263	13.264	6.680	4136.773	78.36	5.4611E-06
10	-12.553	12.554	6.181	4231.522	78.74	4.8376E-08
15	-11.298	11.299	5.483	4293.265	78.98	-3.3503E-06
20	-10.097	10.098	4.885	4306.853	79.03	-4.0851E-06
25	-9.770	9.770	5.085	4002.860	77.80	1.3548E-05
30	-9.115	9.115	4.686	4052.490	78.01	1.0489E-05
35	-8.897	8.897	4.786	3872.509	77.22	2.1957E-05
40	-8.460	8.297	4.435	3897.000	76.74	2.0334E-05
45	-8.515	8.515	4.687	3784.816	76.82	2.7940E-05
50	-8.733	8.733	4.687	3882.140	77.27	2.1317E-05
55	-8.678	8.679	4.587	3941.917	77.53	1.7410E-05
60	-7.914	7.914	4.188	3937.181	77.51	1.7716E-05
65	-8.242	8.242	4.387	3913.663	77.41	1.9242E-05
70	-8.187	8.474	4.545	3884.145	78.28	2.1184E-05
75	-8.806	8.242	4.433	3873.251	78.21	2.1908E-05
80	-7.750	8.187	4.376	3897.814	78.92	2.0281E-05
85	-7.587	7.969	4.329	3835.079	78.47	2.4478E-05
90	-7.368	7.751	4.229	3818.110	78.42	2.5636E-05
					Promedio	1.4932E-05

Gráficas del análisis del regenerador

