Appendix 5.3.3-1

Calculation of Overall Heat Transfer Coefficient(U) and Fouling Factor(f) in Run1

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 3, 94 Time: 03:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18000	18000
Specific Heat (kj/kg/K)	3.979	3.947	3.931	3.919	3.903	3.955	3.951
Inlet Temp. (deg. C)	84	70	58	42	27	18	18
Outlet Temp. (deg. C)	112	84	70	58	42	24	18
Temp. Rise (deg. C)	28	14	12	16	15	6	0
Flashing Temp. (deg. C)	115	86	75	62	49	30	31
Heat Transfer Rate (kj/S)	185.687	92.097	78.620	104.507	97.575	118.650	0.000
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	11.990	6.733	9.806	9.941	13.099	8.656	ERR
U (kW/sq.m/K)	3.315	7.062	4.139	5.427	3.846	2.766	ERR
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 3, 94 Time: 07:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kj/kg/K)	3.979	3.948	3.931	3.919	3.905	3.956	3.951
Inlet Temp. (deg. C)	85	70	58	44	30	19.5	18
Outlet Temp. (deg. C)	112	85	70	58	44	26	19.5
Temp. Rise (deg. C)	27	15	12	14	14	6.5	1.5
Flashing Temp. (deg. C)	114	88	79	64	56	45	48
Heat Transfer Rate (kj/S)	193.976	106.925	85.172	99.064	98.710	132.141	30.456
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	10.097	8.372	14.163	11.628	18.107	22.091	29.244
U (kW/sq.m/K)	4.112	6.594	3.105	4.398	2.814	1.207	0.210
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 16, 94 Time: 20:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	13500	13500
Specific Heat (kj/kg/K)	3.971	3.944	3.931	3.917	3.903	3.958	3.954
Inlet Temp. (deg. C)	82	70	56	42	28	22	18
Outlet Temp. (deg. C)	105	82	70	56	42	28	22
Temp. Rise (deg. C)	23	12	14	14	14	6	4
Flashing Temp. (deg. C)	107	88	75	60	48	32	27
Heat Transfer Rate (kj/S)	152.222	78.880	91.723	91.397	91.070	89.055	59.310
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.106	10.923	10.487	9.308	11.628	6.548	6.805
U (kW/sq.m/K)	3.578	3.728	4.515	5.069	4.043	2.744	1.759
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

2

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 16, 94 Time: 24:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	13500	13500
Specific Heat (kj/kg/K)	3.971	3.943	3.931	3.917	3.903	3.958	3.954
Inlet Temp. (deg. C)	81	70	56	42	29	22	18
Outlet Temp. (deg. C)	105	81	70	56	42	28	22
Temp. Rise (deg. C)	24	11	14	14	13	6	4
Flashing Temp. (deg. C)	107	88	75	61	49	32	28
Heat Transfer Rate (kj/S)	158.840	72.288	91.723	91.397	84.565	89.055	59.310
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.357	11.647	10.487	10.487	12.383	6.548	7.830
U (kW/sq.m/K)	3.633	3.204	4.515	4.499	3.526	2.744	1.528
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 3, 94 Time: 10:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	17500	17500
Specific Heat (kj/kg/K)	3.979	3.938	3.919	3.904	3.898	3.952	3.951
Inlet Temp. (deg. C)	76	58	43	37	38	18	18
Outlet Temp. (deg. C)	112	76	58	43	37	19	18
Temp. Rise (deg. C)	36	18	15	6	-1	1	0
Flashing Temp. (deg. C)	119	84	72	64	51	44	52
Heat Transfer Rate (kj/S)	258.635	127.985	106.140	42.293	-7.038	19.211	0.000
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	19.832	15.272	20.598	23.874	13.494	25.497	ERR
U (kW/sq.m/K)	2.791	4.327	2.660	0.915	-0.269	0.152	ERR
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 3, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5000	5000	5000	5000	5000	17500	17500
Specific Heat (kj/kg/K)	3.953	3.931	3.919	3.909	3.897	3.952	3.952
Inlet Temp. (deg. C)	69	58	48	36	26	19	18
Outlet Temp. (deg. C)	90	69	58	48	36	20	19
Temp. Rise (deg. C)	21	11	10	12	10	1	1
Flashing Temp. (deg. C)	105	72	63	52	42	36	36
Heat Transfer Rate (kj/S)	115.296	60.057	54.431	65.150	54.125	19.211	19.211
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	23.987	7.141	9.102	8.656	10.195	16.495	17.495
U (kW/sq.m/K)	1.029	4.342	3.087	3.886	2.741	0.235	0.222
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 3, 94 Time: 20:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5500	5500	5500	5500	5500	13500	13500
Specific Heat (kj/kg/K)	3.956	3.934	3.921	3.911	3.899	3.957	3.951
Inlet Temp. (deg. C)	72	60	50	38	27	18	18
Outlet Temp. (deg. C)	92	72	60	50	38	27	18
Temp. Rise (deg. C)	20	12	10	12	11	9	0
Flashing Temp. (deg. C)	105	72	64	54	44	34	34
Heat Transfer Rate (kj/S)	120.878	72.123	59.904	71.702	65.525	133.549	0.000
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	21.469	ERR	7.982	8.656	10.562	10.887	ERR
U (kW/sq.m/K)	1.205	ERR	3.874	4.276	3.203	2.475	ERR
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 3, 94 Time: 23:02

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5500	5500	5500	5500	5500	14000	14000
Specific Heat (kj/kg/K)	3.958	3.934	3.921	3.909	3.898	3.954	3.951
Inlet Temp. (deg. C)	72	60	48	37	26	18	17
Outlet Temp. (deg. C)	94	72	60	48	37	22	18
Temp. Rise (deg. C)	22	12	12	11	11	4	1
Flashing Temp. (deg. C)	106	73	65	53	43	34	34
Heat Transfer Rate (kj/S)	133.033	72.123	71.885	65.693	65.508	61.507	15.365
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	21.124	4.678	9.806	9.457	10.562	13.904	16.495
U (kW/sq.m/K)	1.348	7.959	3.785	3.586	3.202	0.893	0.188
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 4, 94 Time: 08:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5600	5600	5600	5600	5600	11000	11000
Specific Heat (kj/kg/K)	3.956	3.934	3.923	3.913	3.901	3.954	3.951
Inlet Temp. (deg. C)	72	62	52	40	25	18	18
Outlet Temp. (deg. C)	92	72	62	52	40	22	18
Temp. Rise (deg. C)	20	10	10	12	15	4	0
Flashing Temp. (deg. C)	105	72	64	54	44	33	30
Heat Transfer Rate (kj/S)	123.076	61.196	61.024	73.043	91.023	48.327	0.000
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	21.469	ERR	5.581	6.167	9.627	12.897	ERR
U (kW/sq.m/K)	1.227	ERR	5.645	6.115	4.881	0.756	ERR
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

5

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 5, 94 Time: 14:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18000	18000
Specific Heat (kj/kg/K)	3.965	3.938	3.925	3.913	3.899	3.954	3.951
Inlet Temp. (deg. C)	76	64	52	38	24	18	16
Outlet Temp. (deg. C)	100	76	64	52	38	23	18
Temp. Rise (deg. C)	24	12	12	14	14	5	2
Flashing Temp. (deg. C)	112	80	71	58	45	29	29
Heat Transfer Rate (kj/S)	158.600	78.760	78.500	91.303	90.977	98.850	39.510
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	21.846	8.656	12.018	11.628	12.743	8.249	11.972
U (kW/sq.m/K)	1.554	4.697	3.372	4.054	3.686	2.418	0.666
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 6, 94 Time: 04:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	14000	14000
Specific Heat (kj/kg/K)	3.979	3.947	3.932	3.919	3.905	3.952	3.951
Inlet Temp. (deg. C)	84	71	58	44	30	18	18
Outlet Temp. (deg. C)	112	84	71	58	44	19	18
Temp. Rise (deg. C)	28	13	13	14	14	1	0
Flashing Temp. (deg. C)	117	85	75	61	50	42	41
Heat Transfer Rate (kj/S)	185.687	85.518	85.193	91.443	91.117	15.369	0.000
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	14.838	4.926	8.985	8.071	11.628	23.496	ERR
U (kW/sq.m/K)	2.678	8.963	4.895	5.849	4.045	0.132	ERR
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 7, 94 Time: 04:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	14000	14000
Specific Heat (kj/kg/K)	3.965	3.938	3.925	3.914	3.901	3.955	3.951
Inlet Temp. (deg. C)	76	64	53	40	27	18	16
Outlet Temp. (deg. C)	100	76	64	53	40	24	18
Temp. Rise (deg. C)	24	12	11	13	13	6	2
Flashing Temp. (deg. C)	117	78	68	56	45	27	25
Heat Transfer Rate (kj/S)	158.600	78.760	71.958	84.803	84.522	92.283	30.730
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	27.262	6.167	8.322	7.766	10.149	5.461	7.958
U (kW/sq.m/K)	1.245	6.594	4.464	5.638	4.300	3.410	0.779
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 8, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18500	18500
Specific Heat (kj/kg/K)	3.977	3.948	3.931	3.917	3.903	3.956	3.951
Inlet Temp. (deg. C)	85	69	56	42	28	18	17
Outlet Temp. (deg. C)	110	85	69	56	42	25	18
Temp. Rise (deg. C)	25	16	13	14	14	7	1
Flashing Temp. (deg. C)	111	91	80	63	50	29	27
Heat Transfer Rate (kj/S)	165.708	105.280	85.172	91.397	91.070	142.306	20.304
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	7.673	12.314	16.663	12.743	13.839	6.920	9.491
U (kW/sq.m/K)	4.622	4.414	2.639	3.703	3.397	4.150	0.432
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

7

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 9, 94 Time: 04:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18000	18000
Specific Heat (kj/kg/K)	3.977	3.948	3.931	3.917	3.902	3.955	3.951
Inlet Temp. (deg. C)	85	70	56	41	28	18	17
Outlet Temp. (deg. C)	110	85	70	56	41	24	18
Temp. Rise (deg. C)	25	15	14	15	13	6	1
Flashing Temp. (deg. C)	112	85	73	58	45	27	25
Heat Transfer Rate (kj/S)	165.708	98.700	91.723	97.925	84.543	118.650	19.755
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.605	ERR	8.071	7.009	8.985	5.461	7.489
U (kW/sq.m/K)	3.692	ERR	5.867	7.213	4.858	4.384	0.532
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 10, 94 Time: 04:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18500	18500
Specific Heat (kj/kg/K)	3.977	3.947	3.934	3.913	3.904	3.954	3.951
Inlet Temp. (deg. C)	84	72	52	43	28	18	17
Outlet Temp. (deg. C)	110	84	72	52	43	23	18
Temp. Rise (deg. C)	26	12	20	9	15	5	1
Flashing Temp. (deg. C)	111	85	75	60	49	34	34
Heat Transfer Rate (kj/S)	172.337	78.940	131.133	58.695	97.600	101.596	20.304
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	7.889	4.678	9.819	11.940	11.974	13.344	16.495
U (kW/sq.m/K)	4.676	8.711	6.895	2.538	4.208	1.536	0.248
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 11, 94 Time: 04:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6200	6200	6200	6200	6200	18000	18000
Specific Heat (kj/kg/K)	3.979	3.949	3.934	3.919	3.905	3.954	3.951
Inlet Temp. (deg. C)	86	72	58	44	29	18	17
Outlet Temp. (deg. C)	110.2	86	72	58	44	23	18
Temp. Rise (deg. C)	24.2	14	14	14	15	5	1
Flashing Temp. (deg. C)	112	88	76	61	50	34	34
Heat Transfer Rate (kj/S)	165.836	95.215	94.853	94.491	100.879	98.850	19.755
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.063	6.733	9.308	8.071	11.974	13.344	16.495
U (kW/sq.m/K)	3.916	7.301	5.261	6.044	4.350	1.495	0.242
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 12, 94 Time: 00:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6200	6200	6200	6200	6200	18000	18000
Specific Heat (kj/kg/K)	3.965	3.94	3.927	3.912	3.901	3.886	3.879
Inlet Temp. (deg. C)	86	72	58	44	30	18	17
Outlet Temp. (deg. C)	111	86	72	58	44	24	18
Temp. Rise (deg. C)	25	14	14	14	14	6	1
Flashing Temp. (deg. C)	112	85	76	61	50	34	34
Heat Transfer Rate (kj/S)	170.715	94.998	94.684	94.323	94.057	116.580	19.395
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	7.673	ERR	9.308	8.071	11.628	12.766	16.495
U (kW/sq.m/K)	4.762	ERR	5.252	6.033	4.176	1.843	0.237
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 12, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	17000	17000
Specific Heat (kj/kg/K)	3.98	3.947	3.931	3.917	3.903	3.956	3.952
Inlet Temp. (deg. C)	84	70	56	42	28	20	18
Outlet Temp. (deg. C)	113	84	70	56	42	26	20
Temp. Rise (deg. C)	29	14	14	14	14	6	2
Flashing Temp. (deg. C)	113	90	80	63	50	30	28
Heat Transfer Rate (kj/S)	192.367	92.097	91.723	91.397	91.070	112.087	37.324
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	ERR	11.628	15.991	12.743	13.839	6.548	8.963
U (kW/sq.m/K)	ERR	4.089	2.961	3.703	3.397	3.454	0.840
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 13, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	17000	17000
Specific Heat (kj/kg/K)	3.979	3.95	3.934	3.918	3.903	3.957	3.952
Inlet Temp. (deg. C)	87	72	57	42	28	20	18
Outlet Temp. (deg. C)	112	87	72	57	42	27	20
Temp. Rise (deg. C)	25	15	15	15	14	7	2
Flashing Temp. (deg. C)	114	92	80	64	52	32	28
Heat Transfer Rate (kj/S)	165.792	98.750	98.350	97.950	91.070	130.801	37.324
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.605	10.820	14.204	13.099	15.991	7.996	8.963
U (kW/sq.m/K)	3.694	4.712	3.575	3.860	2.940	3.301	0.840
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 14, 94 Time: 08:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	17000	17000
Specific Heat (kj/kg/K)	3.979	3.95	3.936	3.92	3.905	3.956	3.952
Inlet Temp. (deg. C)	87	74	59	44	28	20	18
Outlet Temp. (deg. C)	112	87	74	59	44	26	20
Temp. Rise (deg. C)	25	13	15	15	16	6	2
Flashing Temp. (deg. C)	115	91	78	63	50	30	28
Heat Transfer Rate (kj/S)	165.792	85.583	98.400	98.000	104.133	112.087	37.324
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	11.193	8.985	9.627	9.627	12.314	6.548	8.963
U (kW/sq.m/K)	3.170	4.918	5.277	5.255	4.366	3.454	0.840
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 15, 94 Time: 4:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	17000	17000
Specific Heat (kj/kg/K)	3.971	3.94	3.929	3.915	3.901	3.955	3.951
Inlet Temp. (deg. C)	78	68	54	40	26	18	18
Outlet Temp. (deg. C)	105	78	68	54	40	24	18
Temp. Rise (deg. C)	27	10	14	14	14	6	0
Flashing Temp. (deg. C)	108	82	70	56	46	28	26
Heat Transfer Rate (kj/S)	178.695	65.667	91.677	91.350	91.023	112.058	0.000
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	11.726	7.982	6.733	6.733	11.628	6.548	ERR
U (kW/sq.m/K)	3.262	4.247	7.030	7.005	4.041	3.453	ERR
Clean-U Value (kW/sq.m/K)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 16, 94 Time: 4:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	13000	13000
Specific Heat (kj/kg/K)	3.962	3.938	3.927	3.914	3.901	3.956	3.952
Inlet Temp. (deg. C)	76	66	53	40	27	20	18
Outlet Temp. (deg. C)	98	76	66	53	40	26	20
Temp. Rise (deg. C)	22	10	13	13	13	6	2
Flashing Temp. (deg. C)	102	80	64	54	44	29	26
Heat Transfer Rate (kj/S)	145.273	65.633	85.085	84.803	84.522	85.713	28.542
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	11.753	7.982	ERR	4.926	8.985	5.461	6.952
U (kW/sq.m/K)	2.645	4.245	ERR	8.888	4.857	3.167	0.828
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 16, 94 Time: 08:10

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5800	5800	5800	5800	5800	13000	13000
Specific Heat (kj/kg/K)	3.965	3.939	3.927	3.914	3.901	3.957	3.953
Inlet Temp. (deg. C)	77	66	53	40	28	21	19
Outlet Temp. (deg. C)	100	77	66	53	40	27	21
Temp. Rise (deg. C)	23	11	13	13	12	6	2
Flashing Temp. (deg. C)	104	84	73	59	47	31	27
Heat Transfer Rate (kj/S)	146.925	69.808	82.249	81.977	75.419	85.735	28.549
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	12.045	11.647	12.383	11.278	12.018	6.548	6.952
U (kW/sq.m/K)	2.611	3.094	3.429	3.753	3.240	2.642	0.829
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 16, 94 Time: 12:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	13500	13500
Specific Heat (kj/kg/K)	3.971	3.943	3.93	3.916	3.902	3.958	3.954
Inlet Temp. (deg. C)	81	69	55	41	29	22	19
Outlet Temp. (deg. C)	105	81	69	55	41	28	22
Temp. Rise (deg. C)	24	12	14	14	12	6	3
Flashing Temp. (deg. C)	107	88	76	61	49	32	27
Heat Transfer Rate (kj/S)	158.840	78.860	91.700	91.373	78.040	89.055	44.483
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.357	12.018	12.743	11.628	13.096	6.548	6.383
U (kW/sq.m/K)	3.633	3.388	3.715	4.057	3.076	2.744	1.406
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: Feb 16, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	13500	13500
Specific Heat (kj/kg/K)	3.971	3.943	3.93	3.916	3.902	3.958	3.954
Inlet Temp. (deg. C)	81	69	56	42	29	22	19
Outlet Temp. (deg. C)	105	81	69	56	42	28	22
Temp. Rise (deg. C)	24	12	13	14	13	6	3
Flashing Temp. (deg. C)	107	89	78	62	50	33	28
Heat Transfer Rate (kj/S)	158.840	78.860	85.150	91.373	84.543	89.055	44.483
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.357	13.096	14.544	11.628	13.470	7.610	7.399
U (kW/sq.m/K)	3.633	3.109	3.022	4.057	3.240	2.362	1.213
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Appendix 5.3.3-2

Calculation of Overall Heat Transfer Coefficient(U) and Fouling Factor(f) in Run 2

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 10, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5900	5900	5900	5900	5900	19000	19000
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	90	78	65	53	40	33	32
Outlet Temp. (deg. C)	111	90	78	65	53	38	33
Temp. Rise (deg. C)	21	12	13	12	13	5	1
Flashing Temp. (deg. C)	112	97	86	70	59	42	41
Heat Transfer Rate (kj/S)	136.462	77.644	83.752	77.113	83.220	102.811	20.552
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	6.794	12.018	13.470	9.806	11.278	6.166	8.490
U (kW/sq.m/K)	4.299	3.335	3.210	4.060	3.809	3.365	0.488
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 10, 94 Time: 20:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5900	5900	5900	5900	5900	18800	18800
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	91	79	66	53	40	33	32
Outlet Temp. (deg. C)	112	91	79	66	53	38	33
Temp. Rise (deg. C)	21	12	13	13	13	5	1
Flashing Temp. (deg. C)	114	96	84	69	58	41	40
Heat Transfer Rate (kj/S)	136.462	77.644	83.752	83.539	83.220	101.729	20.335
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.598	9.806	10.149	7.766	10.149	5.098	7.489
U (kW/sq.m/K)	3.397	4.088	4.260	5.553	4.233	4.027	0.548
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 11, 94 Time: 00:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18500	18500
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	90	79	66	53	41	33	32
Outlet Temp. (deg. C)	112	90	79	66	53	38	33
Temp. Rise (deg. C)	22	11	13	13	12	5	1
Flashing Temp. (deg. C)	113	96	84	69	58	41	40
Heat Transfer Rate (kj/S)	145.383	72.380	85.172	84.955	78.120	100.106	20.011
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	7.016	10.562	10.149	7.766	9.806	5.098	7.489
U (kW/sq.m/K)	4.435	3.538	4.333	5.648	4.113	3.963	0.539
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 11, 94 Time: 04:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5900	5900	5900	5900	5900	19500	19500
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	89	79	65	52	40	32	31
Outlet Temp. (deg. C)	112	89	79	65	52	38	32
Temp. Rise (deg. C)	23	10	14	13	12	6	1
Flashing Temp. (deg. C)	113	96	84	68	58	41	40
Heat Transfer Rate (kj/S)	149.458	64.703	90.195	83.539	76.818	126.620	21.093
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	7.237	11.270	10.487	7.766	10.923	5.461	8.490
U (kW/sq.m/K)	4.420	2.964	4.440	5.553	3.631	4.678	0.501
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 11, 94 Time: 08:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18600	18600
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	90	80	67	54	42	33	32
Outlet Temp. (deg. C)	112	90	80	67	54	38	33
Temp. Rise (deg. C)	22	10	13	13	12	5	1
Flashing Temp. (deg. C)	114	95	84	70	60	42	38
Heat Transfer Rate (kj/S)	145.383	65.800	85.172	84.955	78.120	100.647	20.119
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.853	9.102	8.985	7.766	10.923	6.166	5.485
U (kW/sq.m/K)	3.515	3.732	4.894	5.648	3.692	3.294	0.740
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 11, 94 Time: 12:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	17500	17500
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	90	78	66	54	42	33	32
Outlet Temp. (deg. C)	111	90	78	66	54	38	33
Temp. Rise (deg. C)	21	12	12	12	12	5	1
Flashing Temp. (deg. C)	112	95	84	70	60	42	40
Heat Transfer Rate (kj/S)	138.775	78.960	78.620	78.420	78.120	94.694	18.929
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	6.794	9.806	10.923	8.656	10.923	6.166	7.489
U (kW/sq.m/K)	4.372	4.157	3.716	4.677	3.692	3.099	0.510
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 11, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages					
		# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5800	5800	5800	5800	5800	17800	17800
Specific Heat (kj/kg/K)	3.953	3.942	3.928	3.918	3.908	3.899	3.894
Inlet Temp. (deg. C)	88	72	62	52	42	33	32
Outlet Temp. (deg. C)	102	88	72	62	52	38	33
Temp. Rise (deg. C)	14	16	10	10	10	5	1
Flashing Temp. (deg. C)	110	92	79	67	57	48	39
Heat Transfer Rate (kj/S)	89.162	101.616	63.284	63.123	62.962	96.392	19.254
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	13.839	9.941	11.270	9.102	9.102	12.332	6.487
U (kW/sq.m/K)	1.379	5.277	2.899	3.580	3.571	1.577	0.599
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 11, 94 Time: 20:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5800	5800	5800	5800	5800	17600	17600
Specific Heat (kj/kg/K)	3.953	3.942	3.928	3.918	3.908	3.899	3.894
Inlet Temp. (deg. C)	80	70	61	52	41	33	32
Outlet Temp. (deg. C)	92	80	70	61	52	38	33
Temp. Rise (deg. C)	12	10	9	9	11	5	1
Flashing Temp. (deg. C)	110	82	78	64	56	41	38
Heat Transfer Rate (kj/S)	76.425	63.510	56.956	56.811	69.258	95.309	19.037
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	23.491	5.581	11.940	6.492	8.322	5.098	5.485
U (kW/sq.m/K)	0.696	5.875	2.463	4.518	4.296	3.773	0.700
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 12, 94 Time: 00:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5600	5600	5600	5600	5600	18000	18000
Specific Heat (kj/kg/K)	3.953	3.942	3.928	3.918	3.908	3.899	3.894
Inlet Temp. (deg. C)	76	67	58	49	40	32	31
Outlet Temp. (deg. C)	92	76	67	58	49	34	32
Temp. Rise (deg. C)	16	9	9	9	9	2	1
Flashing Temp. (deg. C)	110	78	70	60	52	43	38
Heat Transfer Rate (kj/S)	98.386	55.188	54.992	54.852	54.712	38.990	19.470
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	25.158	5.279	6.492	5.279	6.492	9.967	6.487
U (kW/sq.m/K)	0.837	5.397	4.373	5.364	4.351	0.789	0.606
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 12, 94 Time: 04:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	5600	5600	5600	5600	5600	18000	18000
Specific Heat (kj/kg/K)	3.953	3.942	3.928	3.918	3.908	3.899	3.894
Inlet Temp. (deg. C)	75	67	58	49	40	32	31
Outlet Temp. (deg. C)	91	75	67	58	49	34	32
Temp. Rise (deg. C)	16	8	9	9	9	2	1
Flashing Temp. (deg. C)	110	78	70	60	52	43	38
Heat Transfer Rate (kj/S)	98.386	49.056	54.992	54.852	54.712	38.990	19.470
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	26.190	6.157	6.492	5.279	6.492	9.967	6.487
U (kW/sq.m/K)	0.804	4.113	4.373	5.364	4.351	0.789	0.606
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 12, 94 Time: 08:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18500	18500
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	90	78	67	54	42	33	32
Outlet Temp. (deg. C)	111	90	78	67	54	38	33
Temp. Rise (deg. C)	21	12	11	13	12	5	1
Flashing Temp. (deg. C)	112	96	85	71	60	43	41
Heat Transfer Rate (kj/S)	138.775	78.960	72.068	84.955	78.120	100.106	20.011
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	6.794	10.923	11.647	8.985	10.923	7.213	8.490
U (kW/sq.m/K)	4.372	3.732	3.195	4.882	3.692	2.800	0.476
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 12, 94 Time: 12:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18000	18000
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	90	78	67	55	42	33	32
Outlet Temp. (deg. C)	110	90	78	67	55	38	33
Temp. Rise (deg. C)	20	12	11	12	13	5	1
Flashing Temp. (deg. C)	113	94	86	71	60	43	42
Heat Transfer Rate (kj/S)	132.167	78.960	72.068	78.420	84.630	97.400	19.470
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.819	8.656	12.717	8.656	10.149	7.213	9.491
U (kW/sq.m/K)	2.881	4.709	2.926	4.677	4.305	2.725	0.414
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 12, 94 Time: 16:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18100	18100
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	91	78	67	55	42	33	32
Outlet Temp. (deg. C)	110	91	78	67	55	38	33
Temp. Rise (deg. C)	19	13	11	12	13	5	1
Flashing Temp. (deg. C)	112	98	88	72	61	45	42
Heat Transfer Rate (kj/S)	125.558	85.540	72.068	78.420	84.630	97.941	19.578
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.080	12.383	14.826	9.806	11.278	9.276	9.491
U (kW/sq.m/K)	3.326	3.566	2.510	4.129	3.874	2.131	0.416
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							

Calculations of Overall Heat Transfer Coefficient (U) and Fouling Factor (f)

Run No. Date: July 12, 94 Time: 20:00

Variables	Brine Heater	Evaporator Stages # 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6000	6000	6000	6000	6000	18000	18000
Specific Heat (kj/kg/K)	3.965	3.948	3.931	3.921	3.906	3.896	3.894
Inlet Temp. (deg. C)	90	78	67	54	41	33	32
Outlet Temp. (deg. C)	110	90	78	67	54	37	33
Temp. Rise (deg. C)	20	12	11	13	13	4	1
Flashing Temp. (deg. C)	112	96	86	72	60	44	41
Heat Transfer Rate (kj/S)	132.167	78.960	72.068	84.955	84.630	77.920	19.470
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.341	10.923	12.717	10.149	11.278	8.850	8.490
U (kW/sq.m/K)	3.391	3.732	2.926	4.322	3.874	1.777	0.463
Clean-U Value (kW/sq.m/K)							
f (sq.m K/kW)							