

Appendix 5.3.3-4

Calculation of Overall Heat Transfer
Coefficient(U) and Fouling Factor(f) in Run 4

OPERATION CONDITIONS FOR RUN 4

1. Operation Period	24th Sep. to 7th Oct.
2. Operation Time	320 h
3. Scale Control Method	PPN(M) Dosing
4. Operation Mode	Recirculation
5. Ball Cleaning	Only at start
6. Top Brine Temperature	112°C
7. Flow Rate	
-Make Up Seawater	3.75 m ³ /h
-Recirculation	6.5 m ³ /h
-Product Water	0.76 m ³ /h
-Blow Brine	2.99 m ³ /h
8. Chemical Constituents of Brine	
-pH at 25°C	8.52
-M-Alkalinity as CaCO ₃	143 mg/L
-Chloride ion	26.770 mg/L
-Concentration factor as Cl ⁻	1.15
9. Dosing Rate of Chemicals	
-Scale Inhibitor = PPN(M)	2 mg/L
-Acid = 98% H ₂ SO ₄	--

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 25, 94 Time: 8:00 Total Operation Time: 16 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.969	3.956	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	91	78.6	65.5	52.6	40.8	36.1	34
Outlet Temp. (deg. C)	112	91	78.6	65.5	52.6	40.5	36.1
Temp. Rise (deg. C)	21	12.4	13.1	12.9	11.8	4.4	2.1
Flashing Temp. (deg. C)	119	93	83.2	70.6	58.3	43.7	38.7
Heat Transfer Rate (kJ/S)	151,243	88,866	93,562	91,841	83,779	89,766	42,821
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)	15.148	6.281	9.722	10.229	10.519	5.087	3.547
U (kW/sq.m/K)	2.137	7.304	4.969	4.635	4.112	3.561	2.436
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.212	-0.015	0.005	0.020	0.047	0.085	0.214

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 25, 94

Time: 12:00

Total Operation Time: 20 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.989	3.956	3.943	3.933	3.970	3.968
Inlet Temp. (deg. C)	91	65.7	52.9	41.2	36.6	34
Outlet Temp. (deg. C)	112	78.5	65.7	52.9	40.5	36.6
Temp. Rise (deg. C)	21	12.8	12.8	11.7	3.9	2.6
Flashing Temp. (deg. C)	119	83.7	71.1	58.7	44.3	39.2
Heat Transfer Rate (kJ/s)	151,243	91,421	91,134	83,076	79,569	53,019
Heat Transfer Area (sq.m)	4,6723	1,937	1,937	1,937	4,9556	4,9556
L.M.T.D. (deg. K)	15,148	10,308	10,535	10,595	5,522	3,751
U (kW/sq.m/°C)	2,137	4,579	4,466	4,048	2,908	2,852
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.212	0.022	0.028	0.051	0.148	0.155

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 25, 94

Time: 16:00

Total Operation Time: 24 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/K)	3.989	3.956	3.943	3.933	3.970	3.968	3.968	3.968	
Inlet Temp. (deg. C)	91	65.6	52.9	41.1	36.6	34	34	34	
Outlet Temp. (deg. C)	112	78.6	65.6	52.9	40.5	36.6	36.6	36.6	
Temp. Rise (deg. C)	21	13	12.7	11.8	3.9	2.6	2.6	2.6	
Flashing Temp. (deg. C)	119	83.8	71.3	58.6	44.3	39.2	39.2	39.2	
Heat Transfer Rate (kJ/s)	151.243	92.849	90.421	83.785	79.569	53.019	53.019	53.019	
Heat Transfer Area (sq. m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	15.148	10.377	10.837	10.519	5.522	3.751	3.751	3.751	
U (kW/sq.m/K)	2.137	4.619	4.307	4.112	2.908	2.852	2.852	2.852	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/kW)	0.212	0.020	0.036	0.047	0.148	0.155	0.155	0.155	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 25, 94 Time: 20:00 Total Operation Time: 28 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.956	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	91	65.6	52.7	40.8	36.3	33
Outlet Temp. (deg. C)	112	78.5	65.6	52.7	41	36.3
Temp. Rise (deg. C)	21	12.9	12.9	11.9	4.7	3.3
Flashing Temp. (deg. C)	119.5	83.6	71.1	58.4	44	39
Heat Transfer Rate (KJ/S)	151.243	92.134	91.843	84.490	95.892	67.286
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.730	10.229	10.682	10.555	4.986	4.133
U (kW/sq.m/K)	2.058	4.650	4.439	4.133	3.881	3.285
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.230	0.019	0.029	0.046	0.062	0.108

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 26, 94

Time: 00:00

Total Operation Time: 32 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.956	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	91	65.5	52.6	40.7	36.3	33
Outlet Temp. (deg. C)	112	78.5	65.5	52.6	40	36.3
Temp. Rise (deg. C)	21	12.5	12.9	11.9	3.7	3.3
Flashing Temp. (deg. C)	120	83.3	70.6	58.3	43.9	38.9
Heat Transfer Rate (kJ/s)	151.243	92.847	91.841	84.489	75.483	67.286
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.306	9.919	10.229	10.555	5.546	4.027
U (kW/sq.m/K)	1.985	4.832	4.635	4.132	2.747	3.372
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.247	0.011	0.020	0.046	0.168	0.101

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 26, 94

Time: 04:00

Total Operation Time: 36 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	90	65.4	52.5	40.5	36.1	33
Outlet Temp. (deg. C)	112	78.3	65.4	52.5	40	36.1
Temp. Rise (deg. C)	22	12.9	12.9	12	3.9	3.1
Flashing Temp. (deg. C)	119.5	83.1	70.8	58	43.5	38.7
Heat Transfer Rate (kJ/s)	158.420	92.129	91.838	85.196	79.562	63.207
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.064	9.885	10.569	10.368	5.209	3.949
U (kW/sq.m/K)	2.111	4.811	4.486	4.242	3.082	3.230
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.217	0.012	0.027	0.040	0.128	0.114

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 26, 94 Time: 08:00 Total Operation Time: 40 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.932	3.970	3.988
Inlet Temp. (deg. C)	90	65.4	52.6	40.7	36.1	34
Outlet Temp. (deg. C)	112	78.4	65.4	52.6	41	36.1
Temp. Rise (deg. C)	22	13	12.8	11.9	4.9	2.1
Flashing Temp. (deg. C)	120	83.3	70.6	58.1	43.8	38.7
Heat Transfer Rate (kJ/s)	158.420	92.844	91.128	84.489	99.971	42.821
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.645	10.034	10.308	10.332	4.844	3.547
U (KW/sq.m/K)	2.037	4.777	4.564	4.222	4.165	2.436
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.234	0.013	0.023	0.041	0.044	0.214

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 26, 94 Time: 12:00 Total Operation Time: 44 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	19000	19000
Specific Heat (kJ/kg/°C)	3.988	3.955	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	90	65.4	52.6	41.1	36.3	34
Outlet Temp. (deg. C)	112	78.3	65.4	52.6	41.3	36.3
Temp. Rise (deg. C)	22	12.9	12.8	11.5	5	2.3
Flashing Temp. (deg. C)	119.5	83.3	71.2	58.4	44.6	38.8
Heat Transfer Rate (kJ/S)	158.420	92.129	91.128	81.652	104.772	48.168
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. C)	16.064	10.115	10.984	10.523	5.421	3.526
U (kW/sq.m/°C)	2.111	4.702	4.283	4.006	3.900	2.757
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.217	0.017	0.037	0.054	0.060	0.167

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 28, 94 Time: 16:00 Total Operation Time: 48 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/K)	3.988	3.956	3.944	3.932	3.970	3.968	3.968	3.968	
Inlet Temp. (deg. C)	90	66.4	52.7	40.8	36.5	33.5	33.5	33.5	
Outlet Temp. (deg. C)	112	78.3	66.4	52.7	41	36.5	36.5	36.5	
Temp. Rise (deg. C)	22	11.9	13.7	11.9	4.5	3	3	3	
Flashing Temp. (deg. C)	119.5	83.6	71	58.5	44.3	38.8	38.8	38.8	
Heat Transfer Rate (kJ/S)	158.420	84.998	97.547	84.490	91.813	61.173	61.173	61.173	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	16.064	10.109	9.921	10.666	5.231	3.594	3.594	3.594	
U (kW/sq.m/K)	2.111	4.341	5.076	4.090	3.542	3.435	3.435	3.435	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/kW)	0.217	0.034	0.001	0.048	0.086	0.095	0.095	0.095	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 26, 94 Time: 20:00 Total Operation Time: 52 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.956	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	90	66.3	52.4	40.5	36.2	33
Outlet Temp. (deg. C)	112	78.2	66.3	52.4	41	36.2
Temp. Rise (deg. C)	22	11.9	13.9	11.9	4.8	3.2
Flashing Temp. (deg. C)	119.5	83.7	71	58.3	43.9	38.5
Heat Transfer Rate (kJ/S)	158.420	84.996	98.967	84.485	97.931	65.247
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.064	10.332	10.105	10.777	4.915	3.670
U (kW/sq.m/K)	2.111	4.247	5.056	4.047	4.020	3.587
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.217	0.039	0.002	0.051	0.053	0.083

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 27, 94 Time: 00:00 Total Operation Time: 56 hr.

Variables	Evaporator Stages						
	Brine Heater	#1	#2	#3	#4	#5	#6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.969	3.955	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	91	78	65.2	52.2	40.4	36	32.5
Outlet Temp. (deg. C)	112	91	78	65.2	52.2	40.5	36
Temp. Rise (deg. C)	21	13	12.8	13	11.8	4.5	3.5
Flashing Temp. (deg. C)	119	93.1	83.1	70.4	58.1	43.7	38.4
Heat Transfer Rate (KJ/S)	151.243	93.158	91.409	92.545	83.772	91.805	71.360
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)	15.148	6.590	10.195	10.377	10.741	5.125	3.891
U (kW/sq.m/K)	2.137	7.298	4.629	4.604	4.027	3.615	3.701
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.212	-0.014	0.020	0.021	0.052	0.081	0.074

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 27, 94 Time: 04:00 Total Operation Time: 60 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.955	3.943	3.952	3.970	3.967
Inlet Temp. (deg. C)	91	65	52	39.9	35.7	32
Outlet Temp. (deg. C)	112	77.9	65	52	40	35.7
Temp. Rise (deg. C)	21	12.9	13	12.1	4.3	3.7
Flashing Temp. (deg. C)	120	83.1	70.4	57.8	43.4	38
Heat Transfer Rate (kJ/S)	151.243	92.119	92.541	85.896	87.720	75.433
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.306	10.343	10.604	10.737	5.260	3.859
U (kW/sq.m/K)	1.985	4.598	4.505	4.130	3.365	3.945
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.247	0.021	0.026	0.046	0.101	0.057

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 27, 94 Time: 12:00 Total Operation Time: 68 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.989	3.989	3.955	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	91	78.5	65.3	52.4	40.5	35.7	33
Outlet Temp. (deg. C)	112	91	78.5	65.3	52.4	40.5	35.7
Temp. Rise (deg. C)	21	12.5	13.2	12.9	11.9	4.8	2.7
Flashing Temp. (deg. C)	122	94.1	83.6	70.8	58.2	43.7	38.5
Heat Transfer Rate (kJ/S)	151.243	89.582	94.273	91.836	84.485	97.923	55.050
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)	18.561	7.736	10.331	10.682	10.666	5.239	3.999
U (kW/sq.m/°C)	1.744	5.978	4.711	4.438	4.089	3.772	2.778
Clean-U Value (kW/sq.m/°C)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (Sq.m K/kW)	0.317	0.016	0.016	0.029	0.048	0.069	0.164

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 27, 84 Time: 18:00 Total Operation Time: 72 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.989	3.955	3.943	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	91	65.3	52.4	52.4	40.5	35.7	33
Outlet Temp. (deg. C)	112	78.5	65.3	65.3	52.4	40.5	35.7
Temp. Rise (deg. C)	21	13.2	12.9	12.9	11.9	4.8	2.7
Flashing Temp. (deg. C)	122	83.6	70.8	70.8	58.2	43.7	38.5
Heat Transfer Rate (kJ/s)	151.243	94.273	91.836	91.836	84.485	97.923	55.050
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. C)	18.561	10.331	10.682	10.682	10.666	5.239	3.999
U (kW/sq.m/°C)	1.744	4.711	4.438	4.438	4.089	3.772	2.778
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.317	0.016	0.029	0.029	0.048	0.069	0.164

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 27, 94 Time: 20:00 Total Operation Time: 76 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.955	3.943	3.932	3.970	3.987
Inlet Temp. (deg. C)	91	65.2	52.2	40.3	35.5	32
Outlet Temp. (deg. C)	112	78.2	65.2	52.2	40	35.5
Temp. Rise (deg. C)	21	13	13	11.9	4.5	3.5
Flashing Temp. (deg. C)	122	83.5	70.7	58	43.4	38.3
Heat Transfer Rate (kJ/s)	151.243	92.839	92.545	84.481	91.798	71.355
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	18.561	10.491	10.717	10.666	5.338	4.316
U (kW/sq.m/K)	1.744	4.569	4.458	4.089	3.471	3.336
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.317	0.023	0.028	0.048	0.092	0.104

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 28, 94 Time: 00:00 Total Operation Time: 80 hr.

Variables	Evaporator Stages					
	#1	#2	#3	#4	#5	#6
Flowrate (kg/h)	6500	6500	6500	6500	18600	18600
Specific Heat (kJ/kg/K)	3.989	3.955	3.943	3.932	3.970	3.967
Inlet Temp. (deg. C)	91	65.1	52	39.9	35.5	32
Outlet Temp. (deg. C)	112	78.2	65.1	52	40	35.5
Temp. Rise (deg. C)	21	13.1	13.1	12.1	4.5	3.5
Flashing Temp. (deg. C)	121	83.3	70.5	57.6	43.2	38.3
Heat Transfer Rate (K/S)	151.243	93.552	93.254	85.896	92.294	71.740
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	17.442	10.297	10.639	10.514	5.125	4.316
U (kW/sq.m/K)	1.856	4.690	4.525	4.218	3.634	3.354
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.282	0.017	0.025	0.041	0.079	0.102

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 28, 94

Time: 04:00

Total Operation Time: 94 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500	18500	
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.932	3.969	3.967	3.967	3.967	
Inlet Temp. (deg. C)	89	65	52	39.9	35.3	32	32	32	
Outlet Temp. (deg. C)	112	78	65	52	39.5	35.3	35.3	35.3	
Temp. Rise (deg. C)	23	11	13	12.1	4.2	3.3	3.3	3.3	
Flashing Temp. (deg. C)	119	83.3	70.5	57.8	43.2	38.2	38.2	38.2	
Heat Transfer Rate (kJ/s)	165.596	92.835	92.541	85.896	85.674	67.276	67.276	67.276	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	15.804	10.491	10.717	10.737	5.537	4.343	4.343	4.343	
U (kW/sq.m/K)	2.243	4.569	4.458	4.130	3.122	3.126	3.126	3.126	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/kW)	0.190	0.023	0.028	0.046	0.124	0.124	0.124	0.124	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 28, 94

Time: 08:00

Total Operation Time: 88 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/m)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.989	3.969	3.955	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	91.5	78.4	65.4	52.4	40.6	35.7	33.5
Outlet Temp. (deg. C)	112	91.5	78.4	65.4	52.4	41	35.7
Temp. Rise (deg. C)	20.5	13.1	13	13	11.8	5.3	2.2
Flashing Temp. (deg. C)	119	93.6	83.3	70.7	58.2	43.7	38.5
Heat Transfer Rate (KJ/S)	147.653	93.887	92.844	92.549	83.776	108.128	44.857
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)	14.982	6.618	10.034	10.491	10.630	4.879	3.794
U (KW/sq.m/K)	2.109	7.324	4.777	4.554	4.069	4.472	2.386
Clean-U Value (KW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.218	-0.015	0.013	0.023	0.050	0.028	0.223

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 28, 94 Time: 16:00 Total Operation Time: 96 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.955	3.943	3.943	3.952	3.970	3.988
Inlet Temp. (deg. C)	91	78.2	65.3	52.5	40.7	35.9	33
Outlet Temp. (deg. C)	112	91	78.2	65.3	52.5	41	35.9
Temp. Rise (deg. C)	21	12.8	12.9	12.8	11.8	5.1	2.9
Flashing Temp. (deg. C)	120	93.9	83.3	70.6	58.4	43.9	38.7
Heat Transfer Rate (kJ/S)	151.243	91.728	92.126	91.125	83.778	104.050	59.129
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)	16.306	7.579	10.229	10.422	10.741	5.026	4.080
U (kW/sq.m/K)	1.985	6.249	4.650	4.514	4.027	4.178	2.925
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.247	0.009	0.019	0.025	0.052	0.043	0.146

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 28, 94

Time: 20:00

Total Operation Time: 100 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.989	3.955	3.943	3.932	3.970	3.967
Inlet Temp. (deg. C)	90.5	65	52.2	40.1	35.7	32.5
Outlet Temp. (deg. C)	112	78.1	65	52.2	40	35.7
Temp. Rise (deg. C)	21.5	13.1	12.8	12.1	4.3	3.2
Flashing Temp. (deg. C)	119	83.6	70.9	58	43.6	38.6
Heat Transfer Rate (kJ/s)	154.832	93.550	91.119	85.900	87.720	65.242
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.313	10.752	11.096	10.737	5.471	4.304
U (kW/sq.m/K)	2.164	4.492	4.239	4.130	3.235	3.059
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.206	0.027	0.040	0.046	0.113	0.131

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 29, 94 Time: 12:00 Total Operation Time: 116 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	90	65.1	52.5	40.8	35.8	33
Outlet Temp. (deg. C)	112	78.2	65.1	52.5	40	35.8
Temp. Rise (deg. C)	22	13.1	12.6	11.7	4.2	2.8
Flashing Temp. (deg. C)	124	83.4	70.7	58.1	43.7	38.8
Heat Transfer Rate (kJ/s)	158.420	93.552	89.699	83.069	85.680	57.089
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	21.124	7.880	10.690	10.373	5.537	4.247
U (kW/sq.m/K)	1.605	4.589	4.332	4.134	3.123	2.712
Clear-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.367	0.029	0.035	0.046	0.124	0.173

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 29, 94

Time: 16:00

Total Operation Time: 120 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.932	3.970	3.968
Inlet Temp. (deg. C)	90	65.1	52.5	40.6	35.7	33
Outlet Temp. (deg. C)	112	78.1	65.1	52.5	40	35.7
Temp. Rise (deg. C)	22	13	12.6	11.9	4.3	2.7
Flashing Temp. (deg. C)	122	83.2	70.7	58.2	43.8	38.7
Heat Transfer Rate (kJ/s)	158.420	92.837	89.699	84.487	87.720	55.050
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	18.914	10.263	10.690	10.555	5.681	4.207
U (kW/sq.m/K)	1.793	4.670	4.332	4.132	3.116	2.641
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.301	0.018	0.035	0.046	0.125	0.183

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 29, 94

Time: 20:00

Total Operation Time: 124 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.955	3.943	3.932	3.970	3.967
Inlet Temp. (deg. C)	91	65.1	52.1	40.2	35.3	32
Outlet Temp. (deg. C)	112	78.2	65.1	52.1	40	35.3
Temp. Rise (deg. C)	21	13.1	13	11.9	4.7	3.3
Flashing Temp. (deg. C)	122	83.3	70.5	57.9	43.3	38.4
Heat Transfer Rate (kJ/s)	151.243	93.552	92.543	84.480	95.877	67.276
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	18.561	10.297	10.604	10.666	5.308	4.552
U (kW/sq.m/K)	1.744	4.690	4.506	4.089	3.645	2.982
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.317	0.017	0.026	0.048	0.078	0.139

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 30, 94 Time: 00:00 Total Operation Time: 128 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.956	3.943	3.932	3.970	3.967
Inlet Temp. (deg. C)	91	65.3	52.2	40.1	35.2	32
Outlet Temp. (deg. C)	112	78.6	65.3	52.2	40	35.2
Temp. Rise (deg. C)	21	13.3	13.1	12.1	4.8	3.2
Flashing Temp. (deg. C)	122	83.4	70.6	57.9	43.2	38.3
Heat Transfer Rate (kJ/s)	151.243	94.988	93.258	85.900	97.916	65.237
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	18.561	10.020	10.525	10.626	5.239	4.512
U (kW/sq.m/K)	1.744	4.894	4.574	4.173	3.772	2.917
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.317	0.008	0.023	0.044	0.069	0.147

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 30, 94

Time: 04:00

Total Operation Time: 152 hr.

Variables	Brine Heater			Evaporator Stages					
	#1	#2	#3	#4	#5	#6	#7	#8	#9
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.932	3.969	3.967	3.967	3.967	3.967
Inlet Temp. (deg. C)	90	64.9	51.8	39.7	34.9	32	34.9	34.9	34.9
Outlet Temp. (deg. C)	112	78	64.9	51.8	40	34.9	40	34.9	34.9
Temp. Rise (deg. C)	22	13.1	13.1	12.1	5.1	2.9	5.1	2.9	2.9
Flashing Temp. (deg. C)	121.5	82.6	69.9	57.5	42.8	37.9	42.8	37.9	37.9
Heat Transfer Rate (kJ/S)	158.420	93.548	93.249	85.892	104.033	59.120	104.033	59.120	59.120
Heat Transfer Area (sq. m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	4.9556
L.M.T.D. (deg. K)	18.353	9.722	10.183	10.626	4.917	4.288	4.917	4.288	4.288
U (kW/sq. m/K)	1.847	4.968	4.728	4.173	4.270	2.782	4.270	2.782	2.782
Clean-U Value (kW/sq. m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
f (sq. m K/kW)	0.285	0.005	0.015	0.044	0.038	0.163	0.038	0.163	0.163

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: September 30, 94

Time: 08:00

Total Operation Time: 136 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.968	3.955	3.943	3.932	3.969	3.967
Inlet Temp. (deg. C)	89.5	78.2	65.1	52	39.9	34.9	32.5
Outlet Temp. (deg. C)	112	89.5	78.2	65.1	52	39.5	34.9
Temp. Rise (deg. C)	22.5	11.3	13.1	13.1	12.1	4.6	2.4
Flashing Temp. (deg. C)	121	92.7	83.1	70.3	57.7	43	37.9
Heat Transfer Rate (kJ/s)	162.008	80.961	93.552	93.254	85.896	93.830	48.929
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)	17.960	7.479	10.068	10.411	10.626	5.482	4.083
U (kW/sq.m/K)	1.931	5.589	4.797	4.624	4.173	3.454	2.418
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.262	0.027	0.012	0.020	0.044	0.093	0.217

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 30, 94 Time: 12:00 Total Operation Time: 140 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.943	3.932	3.969	3.967
Inlet Temp. (deg. C)	90	78.2	65.1	52.2	40.2	35.2	32.5
Outlet Temp. (deg. C)	112	78.2	65.1	52.2	39.5	35.2	35.2
Temp. Rise (deg. C)	22	11.8	12.9	12.9	12	4.3	2.7
Flashing Temp. (deg. C)	121	93.3	83.4	70.7	58	43.4	38.1
Heat Transfer Rate (kJ/s)	158.420	84.550	93.552	91.832	85.191	87.713	55.046
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)	17.788	7.759	10.411	10.795	10.701	5.786	4.103
U (kW/sq.m/K)	1.906	5.626	4.639	4.392	4.110	3.059	2.707
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.268	0.026	0.019	0.032	0.047	0.131	0.173

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 30, 94 Time: 16:00 Total Operation Time: 144 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.968	3.955	3.943	3.932	3.969	3.967
Inlet Temp. (deg. C)	90	65	52.1	40.2	35	32
Outlet Temp. (deg. C)	112	78.2	65	52.1	39.5	35
Temp. Rise (deg. C)	22	13.2	12.9	11.9	4.5	3
Flashing Temp. (deg. C)	122	83.7	70.8	58	43.2	38.4
Heat Transfer Rate (kJ/s)	158.420	94.265	91.830	84.480	91.791	61.159
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. C)	18.914	10.786	11.019	10.777	5.655	4.743
U (kW/sq.m/°C)	1.793	4.512	4.302	4.047	3.276	2.602
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.301	0.026	0.036	0.051	0.109	0.188

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: September 30, 94 Time: 20:00 Total Operation Time: 148 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.968	3.955	3.943	3.932	3.969	3.967
Inlet Temp. (deg. C)	90	78.1	64.9	52	39.9	34.6	32
Outlet Temp. (deg. C)	112	90	78.1	64.9	52	39.5	34.6
Temp. Rise (deg. C)	22	11.9	13.2	12.9	12.1	4.9	2.6
Flashing Temp. (deg. C)	121	93.6	83.5	70.6	57.8	42.8	38.3
Heat Transfer Rate (kJ/S)	158.420	85.265	94.263	91.828	85.896	99.947	53.003
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)	17.788	8.151	10.673	10.907	10.737	5.383	4.885
U (KW/sq.m/K)	1.906	5.400	4.560	4.346	4.130	3.746	2.189
Clean-U Value (KW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.268	0.034	0.023	0.034	0.046	0.071	0.261

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 01, 94 Time: 00:00 Total Operation Time: 152 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90	64.6	51.5	39.9	34.6	32
Outlet Temp. (deg. C)	112	77.8	64.6	51.5	39.4	34.6
Temp. Rise (deg. C)	22	13.2	13.1	11.6	4.8	2.6
Flashing Temp. (deg. C)	120	82.5	69.8	57.2	42.5	37.5
Heat Transfer Rate (kJ/s)	158.420	94.256	93.243	82.342	97.906	53.003
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.645	9.871	10.411	10.448	5.131	4.062
U (kW/sq.m/K)	2.037	4.930	4.624	4.069	3.850	2.633
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.234	0.007	0.020	0.050	0.064	0.184

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 01, 94

Time: 04:00

Total Operation Time: 156 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.968	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90	77.8	64.6	51.5	39.3	34.5	32
Outlet Temp. (deg. C)	112	90	77.8	64.6	51.5	39.5	34.5
Temp. Rise (deg. C)	22	12.2	13.2	13.1	12.2	5	2.5
Flashing Temp. (deg. C)	120	92.9	82.8	70.1	57.3	42.5	37.4
Heat Transfer Rate (kJ/s)	158.420	87.411	94.256	93.243	86.596	101.986	50.964
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)	16.645	7.394	10.217	10.752	10.772	5.098	4.021
U (kW/sq.m/K)	2.037	6.103	4.763	4.477	4.150	4.037	2.357
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.234	0.012	0.014	0.027	0.045	0.052	0.195

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 01, 94

Time: 12:00

Total Operation Time: 164 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (k/kg/K)	3.988	3.955	3.942	3.932	3.969	3.967
Inlet Temp. (deg. C)	90	64.9	51.8	39.7	34.9	32
Outlet Temp. (deg. C)	112	77.9	64.9	51.8	39.5	34.9
Temp. Rise (deg. C)	22	13	13.1	12.1	4.6	2.9
Flashing Temp. (deg. C)	119	83.7	70.6	57.8	43.5	37.5
Heat Transfer Rate (KJ/S)	158.420	92.832	93.249	85.892	93.830	59.120
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.478	11.054	10.977	10.959	6.009	3.871
U (KW/sq.m/K)	2.191	4.335	4.386	4.046	3.151	3.082
Clean-U Value (kw/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.200	0.035	0.032	0.051	0.121	0.128

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 01, 94 Time: 16:00 Total Operation Time: 168 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.968	3.955	3.943	3.932	3.969	3.967
Inlet Temp. (deg. C)	90	78.3	65	52	40	35.2	31.5
Outlet Temp. (deg. C)	112	90	78.3	65	52	39.5	35.2
Temp. Rise (deg. C)	22	11.7	13.3	13	12	4.3	3.7
Flashing Temp. (deg. C)	119.5	93.9	83.9	70.9	58.2	43.4	37.7
Heat Transfer Rate (KJ/S)	158.420	83.834	94.981	92.541	85.187	87.713	75.428
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)	16.064	8.440	10.934	11.166	11.143	5.786	4.074
U (KW/sq.m/K)	2.111	5.128	4.485	4.278	3.947	3.059	3.736
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.217	0.043	0.027	0.038	0.057	0.131	0.072

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 02, 94 Time: 16:00 Total Operation Time: 192 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.932	3.969	3.967
Inlet Temp. (deg. C)	90	64.9	51.9	39.9	35	31.5
Outlet Temp. (deg. C)	112	77.9	64.9	51.9	39	35
Temp. Rise (deg. C)	22	13	13	12	4	3.5
Flashing Temp. (deg. C)	120	83.8	70.7	58	43.2	37.9
Heat Transfer Rate (KJ/S)	158.420	92.832	92.539	85.185	81.589	71.349
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.645	11.166	11.054	11.033	5.979	4.421
U (kW/sq.m/K)	2.037	4.292	4.322	3.986	2.754	3.256
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.234	0.037	0.035	0.055	0.167	0.111

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 02, 94 Time: 20:00 Total Operation Time: 196 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (Kj/kg/K)	3.989	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90.5	64.7	51.7	39.5	34.7	31
Outlet Temp. (deg. C)	112	78	64.7	51.7	39	34.7
Temp. Rise (deg. C)	21.5	13.3	13	12.2	4.3	3.7
Flashing Temp. (deg. C)	119	94	70.5	57.6	42.9	37.7
Heat Transfer Rate (Kj/S)	154.832	94.973	92.534	86.600	87.706	75.422
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.313	10.821	11.054	10.884	5.786	4.605
U (kW/sq.m/K)	2.164	4.531	4.322	4.108	3.059	3.305
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.206	0.025	0.035	0.047	0.131	0.106

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 03, 94 Time: 00:00 Total Operation Time: 200 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18200	18200
Specific Heat (kJ/kg/K)	3.989	3.955	3.943	3.932	3.969	3.967
Inlet Temp. (deg. C)	91	65.1	51.9	39.7	34.6	31.5
Outlet Temp. (deg. C)	112	78.3	65.1	51.9	40	34.6
Temp. Rise (deg. C)	21	13.2	13.2	12.2	5.4	3.1
Flashing Temp. (deg. C)	119	83.6	70.8	57.8	42.9	37.6
Heat Transfer Rate (K/S)	151.243	94.288	93.964	86.603	108.364	62.168
Heat Transfer Area (sq. m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.148	10.559	11.012	10.884	5.135	4.368
U (kW/sq. m/K)	2.137	4.609	4.405	4.108	4.258	2.872
Clean-U Value (kW/sq. m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq. m K/KW)	0.212	0.021	0.031	0.047	0.039	0.152

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 03, 94

Time: 04:00

Total Operation Time: 204 hr.

Variables	Brine Heater			Evaporator Stages					
	#1	#2	#3	#4	#5	#6	#7	#8	
Flowrate (kg/h)	6500	6500	6500	6500	18100	18100	18100	18100	
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.932	3.969	3.967	3.967	3.967	
Inlet Temp. (deg. C)	90	65	51.9	39.7	34.6	32	34.6	32	
Outlet Temp. (deg. C)	112	78.1	65	51.9	39.5	34.6	34.6	34.6	
Temp. Rise (deg. C)	22	13.1	13.1	12.2	4.9	2.6	4.9	2.6	
Flashing Temp. (deg. C)	119	83	70.3	57.7	42.9	37.6	42.9	37.6	
Heat Transfer Rate (kJ/S)	158.420	93.550	93.251	86.603	97.786	51.857	97.786	51.857	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	15.478	10.068	10.525	10.772	5.490	4.166	5.490	4.166	
U (kW/sq.m/K)	2.191	4.797	4.574	4.150	3.594	2.512	3.594	2.512	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.200	0.012	0.023	0.045	0.082	0.202	0.082	0.202	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 03, 94 Time: 08:00 Total Operation Time: 208 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/°C)	3.988	3.956	3.943	3.932	3.969	3.969	3.967	3.967	
Inlet Temp. (deg. C)	90	65.4	52.2	40.1	34.7	34.7	32	34.7	
Outlet Temp. (deg. C)	112	78.5	65.4	52.2	40	40	34.7	34.7	
Temp. Rise (deg. C)	22	13.1	13.2	12.1	5.3	5.3	2.7	2.7	
Flashing Temp. (deg. C)	119	83.3	70.7	58	43.1	43.1	37.8	37.8	
Heat Transfer Rate (kJ/s)	158.420	93.560	93.971	85.900	108.111	108.111	55.042	55.042	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	15.478	9.953	10.559	10.737	5.317	5.317	4.310	4.310	
U (kW/sq.m/°C)	2.191	4.853	4.594	4.130	4.103	4.103	2.577	2.577	
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/kW)	0.200	0.010	0.022	0.046	0.048	0.048	0.192	0.192	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 03, 94 Time: 12:00 Total Operation Time: 212 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.955	3.943	3.932	3.969	3.967
Inlet Temp. (deg. C)	90	65	51.9	39.6	35	32
Outlet Temp. (deg. C)	112	78.2	65	51.9	40	35
Temp. Rise (deg. C)	22	13.2	13.1	12.3	5	3
Flashing Temp. (deg. C)	119	83.6	70.7	57.9	43.2	37.6
Heat Transfer Rate (KJ/S)	158.420	94.265	93.251	87.312	101.994	61.159
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.478	10.673	10.977	11.030	5.314	3.910
U (kW/sq.m/K)	2.191	4.560	4.386	4.087	3.873	3.156
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.200	0.023	0.032	0.049	0.062	0.121

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 03, 94

Time: 16:00

Total Operation Time: 216 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.988	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90	78	64.9	51.8	39.6	34.9	32
Outlet Temp. (deg. C)	112	90	78	64.9	51.8	39.5	34.9
Temp. Rise (deg. C)	22	12	13.1	13.1	12.2	4.6	2.9
Flashing Temp. (deg. C)	119	93.7	83.3	70.8	57.8	43.1	37.4
Heat Transfer Rate (KJ/S)	158.420	85.980	93.548	93.249	86.601	93.830	59.120
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)	15.478	8.303	10.525	11.201	10.994	5.588	3.766
U (kW/sq.m/K)	2.191	5.346	4.589	4.298	4.067	3.388	3.168
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.200	0.036	0.022	0.037	0.050	0.099	0.120

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 03, 94 Time: 20:00 Total Operation Time: 220 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90	64.7	51.5	39.6	34.6	31.8
Outlet Temp. (deg. C)	112	77.8	64.7	51.5	39.2	34.6
Temp. Rise (deg. C)	22	13.1	13.2	11.9	4.6	2.8
Flashing Temp. (deg. C)	119	83.4	70.6	57.5	42.8	37.1
Heat Transfer Rate (KJ/S)	157.202	92.823	93.233	83.819	93.318	56.770
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.478	10.865	11.237	10.887	5.588	3.726
U (kW/sq.m/K)	2.174	4.411	4.284	3.975	3.370	3.074
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.204	0.031	0.037	0.056	0.101	0.129

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 04, 94

Time: 00:00

Total Operation Time: 224 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/°C)	3.988	3.988	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	89.5	77.8	64.7	51.4	39.1	34.3	31
Outlet Temp. (deg. C)	112	89.5	77.8	64.7	51.4	38.5	34.3
Temp. Rise (deg. C)	22.5	11.7	13.1	13.3	12.3	4.2	3.3
Flashing Temp. (deg. C)	120	94	83.5	70.6	57.6	42.7	36.8
Heat Transfer Rate (kJ/s)	160.762	83.178	92.823	93.938	86.631	85.197	66.903
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)	16.813	9.134	10.977	11.272	11.251	6.059	3.921
U (kW/sq.m/°C)	2.047	4.701	4.366	4.303	3.975	2.837	3.443
Clean-U Value (kW/sq.m/°C)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.232	0.061	0.033	0.036	0.055	0.156	0.094

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 04, 94

Time: 04:00

Total Operation Time: 228 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	
Specific Heat (KJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.969	3.966	3.966	
Inlet Temp. (deg. C)	89.5	64.6	51.3	38.9	34.1	34.1	30.5	30.5	
Outlet Temp. (deg. C)	112	77.7	64.6	51.3	38	38	34.1	34.1	
Temp. Rise (deg. C)	22.5	13.1	13.3	12.4	3.9	3.9	3.6	3.6	
Flashing Temp. (deg. C)	120	83.3	70.6	57.4	42.4	42.4	36.7	36.7	
Heat Transfer Rate (KJ/S)	160.762	92.821	93.936	87.333	79.107	79.107	72.981	72.981	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	16.813	10.865	11.384	11.176	6.145	6.145	4.143	4.143	
U (KW/sq.m/K)	2.047	4.411	4.260	4.034	2.598	2.598	3.555	3.555	
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.232	0.031	0.039	0.052	0.189	0.189	0.085	0.085	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 04, 94 Time: 08:00 Total Operation Time: 232 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.967	3.967	3.967	3.967
Inlet Temp. (deg. C)	90	64.8	51.5	39.1	34.1	32	32	32	32
Outlet Temp. (deg. C)	112	77.9	64.8	51.5	39	34.1	34.1	34.1	34.1
Temp. Rise (deg. C)	22	13.1	13.3	12.4	4.9	2.1	2.1	2.1	2.1
Flashing Temp. (deg. C)	119.5	83.2	70.7	57.6	42.6	36.8	36.8	36.8	36.8
Heat Transfer Rate (kJ/S)	157.202	92.826	93.940	87.337	99.399	42.577	42.577	42.577	42.577
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	4.9556
L.M.T.D. (deg. K)	16.064	10.525	11.272	11.176	5.703	3.650	3.650	3.650	3.650
U (kW/sq.m/K)	2.094	4.553	4.303	4.034	3.517	2.354	2.354	2.354	2.354
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.221	0.024	0.036	0.052	0.088	0.229	0.229	0.229	0.229

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 04, 94

Time: 12:00

Total Operation Time: 236 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.969	3.969	3.967	
Inlet Temp. (deg. C)	90	64.7	51.5	39.2	34.4	34.4	32	32	
Outlet Temp. (deg. C)	112	77.9	64.7	51.5	39	39	34.4	34.4	
Temp. Rise (deg. C)	22	13.2	13.2	12.3	4.6	4.6	2.4	2.4	
Flashing Temp. (deg. C)	119.5	83.3	70.6	57.5	42.6	42.6	36.9	36.9	
Heat Transfer Rate (K/S)	157.202	93.533	93.233	86.633	93.315	93.315	48.660	48.660	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	16.064	10.673	11.237	11.030	5.588	5.588	3.566	3.566	
U (kW/sq.m/K)	2.094	4.524	4.284	4.055	3.370	3.370	2.753	2.753	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.221	0.025	0.037	0.051	0.101	0.101	0.167	0.167	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 04, 94 Time: 16:00 Total Operation Time: 240 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (KJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90	64.6	51.4	39.1	34.1	31
Outlet Temp. (deg. C)	112	77.8	64.6	51.4	39	34.1
Temp. Rise (deg. C)	22	13.2	13.2	12.3	4.9	3.1
Flashing Temp. (deg. C)	120.5	83.4	70.6	57.5	42.4	36.6
Heat Transfer Rate (KJ/S)	157.202	93.531	93.231	86.631	99.399	62.847
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	17.219	10.899	11.348	11.141	5.490	3.844
U (kW/sq.m/K)	1.954	4.430	4.241	4.015	3.653	3.299
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.255	0.030	0.040	0.053	0.078	0.107

Brine Heater

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 04, 94

Time: 20:00

Total Operation Time: 244 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.966
Inlet Temp. (deg. C)	90	64.8	51.4	39	34	31
Outlet Temp. (deg. C)	112	77.8	64.8	51.4	39	34
Temp. Rise (deg. C)	22	13	13.4	12.4	5	3
Flashing Temp. (deg. C)	120	83.3	70.6	57.5	42.5	36.7
Heat Transfer Rate (kJ/S)	157.202	92.116	94.646	87.335	101.427	60.819
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.645	10.717	11.194	11.176	5.635	4.015
U (kW/sq.m/K)	2.021	4.437	4.365	4.034	3.632	3.057
Clean-U value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.238	0.029	0.033	0.052	0.079	0.131

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 05, 94 Time: 00:00 Total Operation Time: 248 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.966
Inlet Temp. (deg. C)	89	64.5	51	38.6	33.8	31
Outlet Temp. (deg. C)	112	77.6	64.5	51	38	33.8
Temp. Rise (deg. C)	23	13.1	13.5	12.4	4.2	2.8
Flashing Temp. (deg. C)	119.5	83	70.2	57.2	42.2	36.4
Heat Transfer Rate (kJ/s)	164.322	92.819	95.344	87.328	85.191	56.764
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	16.396	10.639	11.116	11.287	6.059	3.831
U (kW/sq.m/K)	2.145	4.504	4.428	3.994	2.837	2.990
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.210	0.026	0.030	0.054	0.156	0.138

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 05, 94

Time: 04:00

Total Operation Time: 252 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	
Specific Heat (kJ/kg/K)	3.988	3.954	3.942	3.930	3.968	3.968	3.968	3.966	
Inlet Temp. (deg. C)	89	64.2	50.7	38.3	33.5	33.5	29.5	29.5	
Outlet Temp. (deg. C)	112	77.2	64.2	50.7	37.5	37.5	33.5	33.5	
Temp. Rise (deg. C)	23	13	13.5	12.4	4	4	4	4	
Flashing Temp. (deg. C)	119.5	82.5	69.9	56.9	41.8	41.8	36.1	36.1	
Heat Transfer Rate (kJ/S)	164.322	92.102	95.338	87.322	81.129	81.129	81.081	81.081	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	16.396	10.491	11.116	11.287	6.082	6.082	4.294	4.294	
U (kW/sq.m/K)	2.145	4.532	4.428	3.994	2.692	2.692	3.810	3.810	
Clean-U value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.210	0.025	0.030	0.054	0.175	0.175	0.066	0.066	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 05, 94

Time: 08:00

Total Operation Time: 256 hr.

Variables	Brine Heater			Evaporator Stages		
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.954	3.942	3.931	3.968	3.966
Inlet Temp. (deg. C)	89	64.3	50.8	38.4	32.5	32
Outlet Temp. (deg. C)	112	77.4	64.3	50.8	38	32.5
Temp. Rise (deg. C)	23	13.1	13.5	12.4	5.5	0.5
Flashing Temp. (deg. C)	121	82.9	70.3	57	41.7	36
Heat Transfer Rate (kJ/S)	164.322	92.814	95.340	87.324	111.548	10.136
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	18.131	10.752	11.454	11.287	6.038	3.744
U (kW/sq.m/K)	1.940	4.457	4.297	3.994	3.728	0.546
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.259	0.028	0.037	0.054	0.072	1.635

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 05, 94

Time: 12:00

Total Operation Time: 260 hr.

Evaporator Stages

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	6450	18400	18400
Specific Heat (KJ/kg/K)	3.988	3.967	3.955	3.942	3.931	3.969	3.966
Inlet Temp. (deg. C)	89	77.5	64.5	51.2	39	33.8	31
Outlet Temp. (deg. C)	112	89	77.5	64.5	51.2	38.5	33.8
Temp. Rise (deg. C)	23	11.5	13	13.3	12.2	4.7	2.8
Flashing Temp. (deg. C)	120.5	94.2	83.3	70.4	57.4	42.4	36.5
Heat Transfer Rate (KJ/S)	164.322	81.747	92.109	93.934	85.924	95.336	56.764
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)	17.558	9.856	11.054	11.272	11.215	5.943	3.935
U (KW/sq.m/K)	2.003	4.282	4.302	4.302	3.955	3.237	2.911
Clean-U Value (KW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.243	0.082	0.036	0.036	0.057	0.113	0.147

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 05, 94 Time: 16:00 Total Operation Time: 264 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.966
Inlet Temp. (deg. C)	90	64.4	51.1	38.9	33.7	31
Outlet Temp. (deg. C)	112	77.5	64.4	51.1	38.5	33.7
Temp. Rise (deg. C)	22	13.1	13.3	12.2	4.8	2.7
Flashing Temp. (deg. C)	121	83.7	70.5	57.4	42.2	36.4
Heat Transfer Rate (kJ/S)	157,202	92,816	93,932	85,923	97,364	54,736
Heat Transfer Area (sq.m)	4,6723	1,937	1,937	1,937	4,9556	4,9556
L.M.T.D. (deg. K)	17,788	11,536	11,495	11,325	5,771	3,895
U (kW/sq.m/K)	1,891	4,154	4,218	3,917	3,404	2,836
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.272	0.045	0.041	0.059	0.098	0.157

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 05, 94 Time: 20:00 Total Operation Time: 268 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/°C)	3.988	3.968	3.955	3.942	3.931	3.968	3.966
Inlet Temp. (deg. C)	90	77.7	64.4	51	38.5	33.6	30
Outlet Temp. (deg. C)	112	90	77.7	64.4	51	38	33.6
Temp. Rise (deg. C)	22	12.3	13.3	13.4	12.5	4.4	3.6
Flashing Temp. (deg. C)	120	94.4	83.5	70.5	57.3	42.2	36.2
Heat Transfer Rate (kJ/s)	157.202	87.448	94.236	94.637	88.031	89.246	72.976
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)	16.645	9.222	11.159	11.531	11.433	6.139	4.143
U (kW/sq.m/°C)	2.021	4.896	4.360	4.237	3.975	2.933	3.555
Clean-U Value (kW/sq.m/°C)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.238	0.053	0.033	0.040	0.055	0.145	0.085

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 06, 94 Time: 00:00 Total Operation Time: 272 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.954	3.942	3.931	3.968	3.966
Inlet Temp. (deg. C)	89.5	64.3	50.8	38.3	33.4	29.5
Outlet Temp. (deg. C)	112	77.5	64.3	50.8	37.5	33.4
Temp. Rise (deg. C)	22.5	13.2	13.5	12.5	4.1	3.9
Flashing Temp. (deg. C)	120.5	82.9	70.2	57.1	41.9	36
Heat Transfer Rate (kJ/s)	160.762	93.524	95.340	88.027	83.156	79.053
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	17.389	10.673	11.341	11.433	6.227	4.256
U (kW/sq.m/K)	1.979	4.524	4.340	3.975	2.695	3.748
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.249	0.025	0.034	0.056	0.175	0.071

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 06, 94 Time: 04:00 Total Operation Time: 276 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.987	3.967	3.954	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	88.5	77.2	64	50.4	37.8	33	29
Outlet Temp. (deg. C)	112	88.5	77.2	64	50.4	37.5	33
Temp. Rise (deg. C)	23.5	11.3	13.2	13.6	12.6	4.5	4
Flashing Temp. (deg. C)	120.5	93.6	82.7	69.9	56.6	41.5	35.6
Heat Transfer Rate (kJ/s)	167.881	80.316	93.516	96.038	88.723	91.266	81.075
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)	17.727	9.674	10.786	11.376	11.358	5.970	4.294
U (kW/sq.m/K)	2.027	4.286	4.476	4.358	4.033	3.085	3.810
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq. m K/kW)	0.237	0.082	0.027	0.033	0.052	0.128	0.066

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 06, 94

Time: 08:00

Total Operation Time: 280 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.987	3.954	3.942	3.930	3.968	3.966
Inlet Temp. (deg. C)	88.5	64.2	50.7	38.1	32.9	31.5
Outlet Temp. (deg. C)	112	77.4	64.2	50.7	38	32.9
Temp. Rise (deg. C)	23.5	13.2	13.5	12.6	5.1	1.4
Flashing Temp. (deg. C)	121	82.8	70	56.9	41.6	35.7
Heat Transfer Rate (kJ/s)	167.881	93.521	95.338	88.729	103.438	28.381
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	18.302	10.673	11.229	11.358	5.780	3.453
U (kW/sq.m/K)	1.963	4.524	4.383	4.033	3.611	1.659
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.253	0.025	0.032	0.052	0.081	0.407

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 06, 94 Time: 12:00 Total Operation Time: 284 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.968	3.955	3.942	3.931	3.968	3.967
Inlet Temp. (deg. C)	90	77.6	64.4	51.2	38.8	33.6	31.5
Outlet Temp. (deg. C)	112	90	77.6	64.4	51.2	38	33.6
Temp. Rise (deg. C)	22	12.4	13.2	13.2	12.4	4.4	2.1
Flashing Temp. (deg. C)	121	94.4	83.7	70.9	57.5	42.3	36.3
Heat Transfer Rate (kJ/s)	157.202	88.158	93.526	93.226	87.331	89.246	42.574
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)	17.788	9.255	11.460	11.905	11.397	6.244	3.650
U (kW/sq.m/K)	1.891	4.917	4.213	4.043	3.956	2.884	2.354
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.272	0.052	0.041	0.051	0.057	0.151	0.229

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 06, 94 Time: 16:00 Total Operation Time: 288 hr.

Variables	Brine Heater			Evaporator Stages					
	#1	#2	#3	#4	#5	#6	#7	#8	
Flowrate (kg/h)	6450	6450	6450	6450	6450	6450	6450	6450	
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.968	3.966	3.966	3.966	
Inlet Temp. (deg. C)	90	64.4	51.1	38.7	33.5	30	30	30	
Outlet Temp. (deg. C)	112	77.5	64.4	51.1	38	33.5	33.5	33.5	
Temp. Rise (deg. C)	22	13.1	13.3	12.4	4.5	3.5	3.5	3.5	
Flashing Temp. (deg. C)	122	83.5	70.6	57.6	42.3	36.3	36.3	36.3	
Heat Transfer Rate (kJ/S)	157.202	92.816	93.932	87.329	91.273	70.948	70.948	70.948	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	18.914	11.313	11.607	11.617	6.284	4.316	4.316	4.316	
U (kW/sq.m/K)	1.779	4.235	4.178	3.881	2.931	3.317	3.317	3.317	
Clean-U value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.306	0.040	0.043	0.062	0.145	0.105	0.105	0.105	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 07, 94

Time: 00:00

Total Operation Time: 296 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	
Specific Heat (KJ/kg/K)	3.988	3.955	3.942	3.931	3.968	3.968	3.966	3.966	
Inlet Temp. (deg. C)	90	64.4	51	38.5	33.4	29.8	29.8	29.8	
Outlet Temp. (deg. C)	112	77.7	64.4	51	38	33.4	33.4	33.4	
Temp. Rise (deg. C)	22	13.3	13.4	12.5	4.6	3.6	3.6	3.6	
Flashing Temp. (deg. C)	121	83.4	70.5	57.3	42.1	36.1	36.1	36.1	
Heat Transfer Rate (KJ/s)	157.202	94.236	94.637	88.031	93.301	72.974	72.974	72.974	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	17.788	11.047	11.531	11.433	6.114	4.249	4.249	4.249	
U (KW/sq.m/K)	1.891	4.404	4.237	3.975	3.079	3.466	3.466	3.466	
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.272	0.031	0.040	0.055	0.129	0.092	0.092	0.092	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 07, 94 Time: 04:00 Total Operation Time: 300 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	18400
Specific Heat (KJ/kg/K)	3.988	3.954	3.941	3.930	3.968	3.968	3.968	3.968	3.968
Inlet Temp. (deg. C)	89.5	64	50.6	38	33.1	33.1	33.1	33.1	33.1
Outlet Temp. (deg. C)	112	77.1	64	50.6	37.8	37.8	37.8	37.8	37.8
Temp. Rise (deg. C)	22.5	13.1	13.4	12.6	4.7	4.7	4.7	4.7	4.7
Flashing Temp. (deg. C)	121	82.8	70	56.9	41.6	41.6	41.6	41.6	41.6
Heat Transfer Rate (kJ/s)	160.762	92.807	94.628	88.727	95.326	95.326	95.326	95.326	95.326
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	4.9556
L.M.T.D. (deg. K)	17.960	10.977	11.419	11.469	5.838	5.838	5.838	5.838	5.838
U (kW/sq.m/K)	1.916	4.365	4.278	3.994	3.295	3.295	3.295	3.295	3.295
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.266	0.033	0.038	0.054	0.107	0.107	0.107	0.107	0.107

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 07, 94

Time: 08:00

Total Operation Time: 304 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	
Specific Heat (KJ/kg/K)	3.988	3.955	3.942	3.931	3.968	3.968	3.968	3.966	
Inlet Temp. (deg. C)	89	64.4	51	38.5	33.3	33.3	31	31	
Outlet Temp. (deg. C)	112	77.5	64.4	51	38	38	33.3	33.3	
Temp. Rise (deg. C)	23	13.1	13.4	12.5	4.7	4.7	2.3	2.3	
Flashing Temp. (deg. C)	122	83.5	70.6	57.4	42	42	36	36	
Heat Transfer Rate (kJ/S)	164.322	92.816	94.637	88.031	95.329	95.329	46.626	46.626	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	19.264	11.313	11.642	11.543	6.049	6.049	3.733	3.733	
U (kW/sq.m/K)	1.826	4.235	4.197	3.937	3.180	3.180	2.521	2.521	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.291	0.040	0.042	0.058	0.118	0.118	0.201	0.201	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4 Date: October 07, 84 Time: 12:00 Total Operation Time: 308 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90	64.6	51.4	39.1	34.1	31
Outlet Temp. (deg. C)	112	77.8	64.6	51.4	38.5	34.1
Temp. Rise (deg. C)	22	13.2	13.2	12.3	4.4	3.1
Flashing Temp. (deg. C)	121.5	83.7	70.7	57.8	42.7	36.8
Heat Transfer Rate (kJ/s)	157.202	93.531	93.231	86.631	89.253	62.847
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	18.353	11.237	11.460	11.471	6.139	4.054
U (kW/sq.m/K)	1.833	4.297	4.200	3.899	2.934	3.128
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.289	0.037	0.042	0.060	0.145	0.124

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 4

Date: October 07, 94

Time: 20:00

Total Operation Time: 316 hr.

Variables	Brine Heater			Evaporator Stages					
	#1	#2	#3	#4	#5	#6	#7	#8	
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400	18400	18400	
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.966	3.966	3.966	
Inlet Temp. (deg. C)	90	64.6	51.2	39	33.9	31	31	31	
Outlet Temp. (deg. C)	112	77.8	64.6	51.2	38	33.9	33.9	33.9	
Temp. Rise (deg. C)	22	13.2	13.4	12.2	4.1	2.9	2.9	2.9	
Flashing Temp. (deg. C)	121	83.4	70.5	57.6	42.5	36.6	36.6	36.6	
Heat Transfer Rate (kJ/S)	157.202	93.531	94.641	85.924	83.163	58.792	58.792	58.792	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	17.788	10.899	11.507	11.435	6.330	3.975	3.975	3.975	
U (kW/sq.m/K)	1.891	4.430	4.321	3.879	2.651	2.984	2.984	2.984	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/kW)	0.272	0.030	0.035	0.062	0.181	0.139	0.139	0.139	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

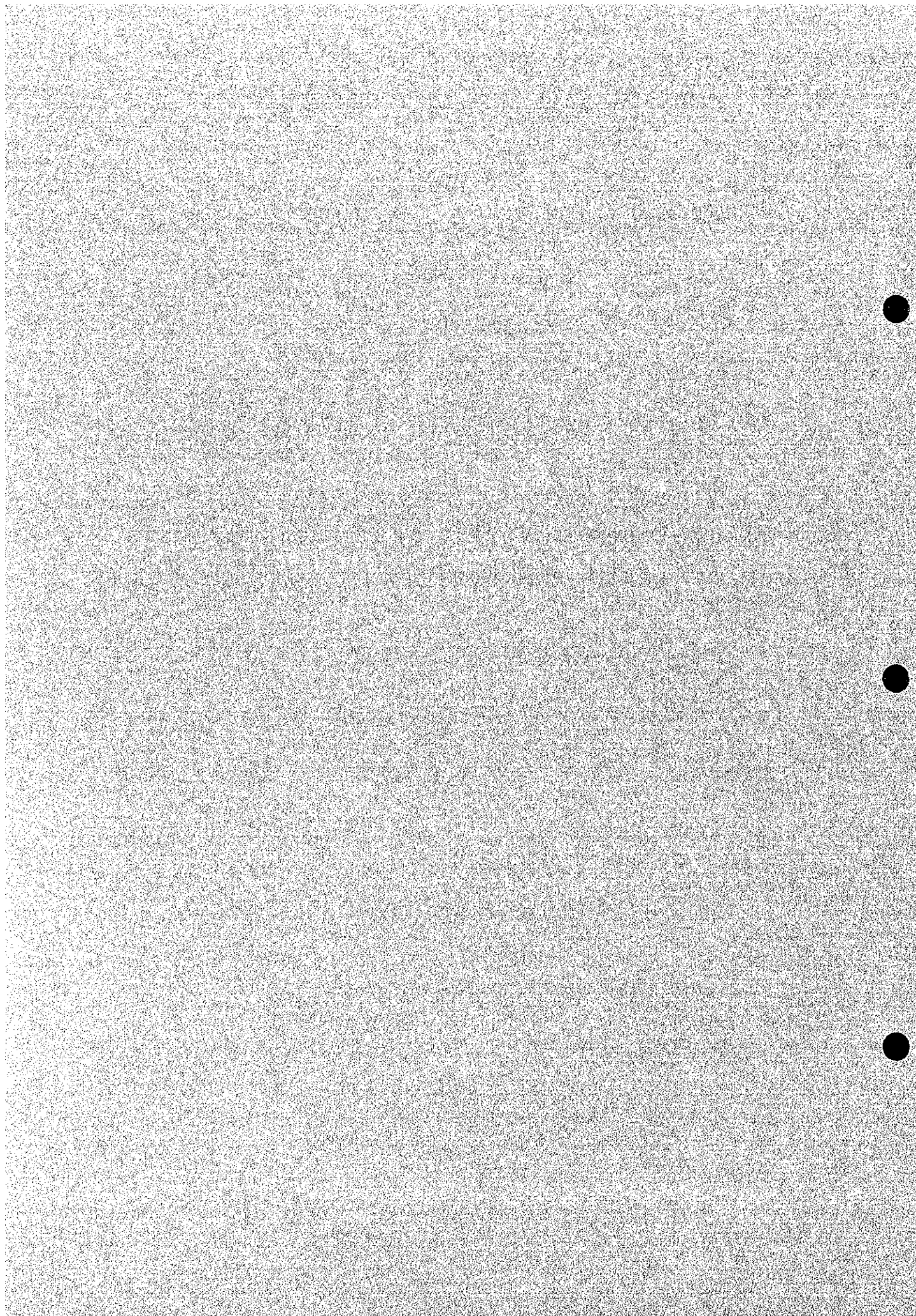
Run No. 4 Date: October 08, 94 Time: 00:00 Total Operation Time: 320 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6450	6450	6450	6450	18400	18400
Specific Heat (kJ/kg/K)	3.988	3.955	3.942	3.931	3.969	3.966
Inlet Temp. (deg. C)	90	64.5	51.1	38.7	33.8	30.5
Outlet Temp. (deg. C)	112	77.7	64.5	51.1	38	33.8
Temp. Rise (deg. C)	22	13.2	13.4	12.4	4.2	3.3
Flashing Temp. (deg. C)	122	94.7	70.8	57.6	42.3	36.5
Heat Transfer Rate (kJ/s)	157,202	93,528	94,639	87,329	85,191	66,898
Heat Transfer Area (sq.m)	4,6723	1,937	1,937	1,937	4,9556	4,9556
L.M.T.D. (deg. K)	18,914	11,124	11,754	11,617	6,163	4,133
U (kW/sq.m/K)	1,779	4,340	4,157	3,881	2,789	3,266
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.306	0.034	0.044	0.062	0.162	0.110



Appendix 5.3.3-5

Calculation of Overall Heat Transfer
Coefficient(U) and Fouling Factor(f) in Run 5-1



OPERATION CONDITIONS
FOR
RUN 5-1

1. Operation Period	15th Oct. to 23rd Oct.
2. Operation Time	143 h
3. Scale Control Method	Hybrid
4. Operation Mode	Recirculation
5. Ball Cleaning	Only at start
6. Top Brine Temperature	112°C
7. Flow Rate	
-Make Up Seawater	3.25 m ³ /h
-Recirculation	6.5 m ³ /h
-Product Water	0.79 m ³ /h
-Blow Brine	2.46 m ³ /h
8. Chemical Constituents of Brine	
-pH at 25°C	8.01
-M-Alkalinity as CaCO ₃	45 - 50 mg/L
-Chloride ion	28,290 mg/L
-Concentration factor as Cl ⁻	1.22
9. Dosing Rate of Chemicals	
-Scale Inhibitor = PPN(M)	1 mg/L
-Acid = 98% H ₂ SO ₄	72 mg/L

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 16, 94 Time: 08:00 Total Operation Time: 12 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.989	3.969	3.954	3.941	3.930	3.969	3.966
Inlet Temp. (deg. C)	91	77.5	63.7	50.3	38	33.9	31
Outlet Temp. (deg. C)	112	91	77.5	63.7	50.3	39	33.9
Temp. Rise (deg. C)	21	13.5	13.8	13.4	12.3	5.1	2.9
Flashing Temp. (deg. C)	116	93.2	82.2	69.1	56	41.8	36.9
Heat Transfer Rate (K/S)	151.243	96.735	98.525	95.355	87.283	104.017	59.111
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)	11.459	6.870	10.071	10.742	10.697	4.917	4.288
U (KW/sq.m/K)	2.825	7.270	5.050	4.583	4.213	4.269	2.782
Clean-U Value (KW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0976	-0.0140	0.0019	0.0221	0.0413	0.0382	0.1634

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 16, 94

Time: 12:00

Total Operation Time: 16 hr.

Variables	Brine Heater			Evaporator Stages								
	# 1	# 2	# 3	# 4	# 5	# 6	# 5	# 4	# 3	# 2	# 1	
Flowrate (kg/h)	6500	6500	6500	6500	6500	6500	6500	6500	6500	6500	6500	18500
Specific Heat (KJ/kg/K)	3.989	3.969	3.954	3.941	3.931	3.927	3.923	3.919	3.915	3.911	3.907	3.967
Inlet Temp. (deg. C)	91	77.5	63.9	50.7	38.5	34.1	31.5	29.1	26.7	24.3	21.9	31.5
Outlet Temp. (deg. C)	112	91	77.5	63.9	50.7	38.5	34.1	31.5	29.1	26.7	24.3	34.1
Temp. Rise (deg. C)	21	13.5	13.6	13.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	2.6
Flashing Temp. (deg. C)	114	93.5	82.2	69	56.3	42.1	37.1	32.1	27.1	22.1	17.1	37.1
Heat Transfer Rate (K/S)	151.243	96.735	97.100	93.938	86.582	89.738	52.999	52.999	52.999	52.999	52.999	52.999
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	4.9556	4.9556	4.9556
L.M.T.D. (deg. K)	8.598	7.273	10.005	10.331	10.550	5.510	4.166	4.166	4.166	4.166	4.166	4.166
U (KW/sq.m/K)	3.765	6.867	5.010	4.694	4.237	3.286	2.567	2.567	2.567	2.567	2.567	2.567
Clean-U Value (KW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0092	-0.0059	0.0035	0.0170	0.0399	0.1082	0.1934	0.1934	0.1934	0.1934	0.1934	0.1934

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 16, 94 Time: 16:00 Total Operation Time: 20 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.954	3.941	3.950	3.969	3.966
Inlet Temp. (deg. C)	90.5	63.8	50.5	38.2	33.9	31
Outlet Temp. (deg. C)	112	77.6	63.8	50.5	38	33.9
Temp. Rise (deg. C)	21.5	13.8	13.3	12.3	4.1	2.9
Flashing Temp. (deg. C)	114	82.5	69.1	56.2	41.9	37
Heat Transfer Rate (kJ/s)	154.832	98.527	94.647	87.287	83.615	59.111
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.726	10.304	10.594	10.697	5.707	4.392
U (kW/sq.m/K)	3.798	4.937	4.612	4.213	2.957	2.716
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0069	0.0065	0.0207	0.0413	0.1421	0.1721

Brine Heater

Evaporator Stages

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 16, 94

Time: 20:00

Total Operation Time: 24 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.989	3.954	3.941	3.930	3.969	3.966
Inlet Temp. (deg. C)	90.5	63.7	50.4	38	33.9	30.5
Outlet Temp. (deg. C)	112	77.5	63.7	50.4	38	33.9
Temp. Rise (deg. C)	21.5	13.8	13.3	12.4	4.1	3.4
Flashing Temp. (deg. C)	114	82.1	68.8	56	41.8	36.9
Heat Transfer Rate (KJ/s)	154.832	98.525	94.645	87.994	83.615	69.300
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.726	9.955	10.365	10.620	5.602	4.487
U (KW/sq.m/K)	3.798	5.110	4.714	4.278	3.012	3.116
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0069	-0.0004	0.0161	0.0377	0.1359	0.1248

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 17, 94

Time: 00:00

Total Operation Time: 28 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	18500
Specific Heat (kJ/kg/°C)	3.969	3.954	3.941	3.930	3.968	3.968	3.966	3.966	3.966
Inlet Temp. (deg. C)	91	63.7	50.2	37.7	33.7	33.7	30.5	30.5	30.5
Outlet Temp. (deg. C)	112	77.5	63.7	50.2	38	38	33.7	33.7	33.7
Temp. Rise (deg. C)	21	13.8	13.5	12.5	4.3	4.3	3.2	3.2	3.2
Flashing Temp. (deg. C)	114	81.9	68.7	55.8	41.6	41.6	36.7	36.7	36.7
Heat Transfer Rate (kJ/S)	151,243	98,525	96,066	88,699	87,692	87,692	65,223	65,223	65,223
Heat Transfer Area (sq.m)	4,6723	1,937	1,937	1,937	4,9556	4,9556	4,408	4,408	4,408
L.M.T.D. (deg. K)	8,598	9,720	10,318	10,655	5,471	5,471	2,986	2,986	2,986
U (kW/sq.m/°C)	3,765	5,233	4,806	4,298	3,234	3,234	5.1	5.1	5.1
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0092	-0.0050	0.0120	0.0366	0.1131	0.1131	0.1388	0.1388	0.1388

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 17, 94

Time: 04:00

Total Operation Time: 32 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.989	3.954	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	90.5	63.5	50	37.6	33.6	30
Outlet Temp. (deg. C)	112	77.4	63.5	50	37.5	33.6
Temp. Rise (deg. C)	21.5	13.9	13.5	12.4	3.9	3.6
Flashing Temp. (deg. C)	114	82.3	68.7	55.7	41.5	36.5
Heat Transfer Rate (K/S)	154.832	99.235	96.061	87.986	79.531	73.372
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.726	10.337	10.548	10.732	5.731	4.460
U (KW/sq.m/K)	3.798	4.956	4.702	4.233	2.801	3.319
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0069	0.0057	0.0166	0.0402	0.1610	0.1052

Brine Heater

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 17, 94

Time: 08:00

Total Operation Time: 36 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.954	3.941	3.930	3.968	3.968	3.968	3.968	3.966
Inlet Temp. (deg. C)	90.5	63.9	50.5	37.9	33.7	33.7	31	31	31
Outlet Temp. (deg. C)	112	77.8	63.9	50.5	38	38	33.7	33.7	33.7
Temp. Rise (deg. C)	21.5	13.9	13.4	12.6	4.3	4.3	2.7	2.7	2.7
Flashing Temp. (deg. C)	114	82.7	69.4	56.1	41.7	41.7	36.8	36.8	36.8
Heat Transfer Rate (K/s)	154.832	99.245	95.359	89.413	87.692	87.692	55.034	55.034	55.034
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	4.9556
L.M.T.D. (deg. K)	8.726	10.337	10.855	10.690	5.576	5.576	4.310	4.310	4.310
U (kW/sq.m/K)	3.798	4.956	4.535	4.318	3.173	3.173	2.577	2.577	2.577
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0069	0.0057	0.0244	0.0555	0.1191	0.1191	0.1920	0.1920	0.1920

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 17, 94

Time: 12:00

Total Operation Time: 40 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.989	3.955	3.942	3.931	3.969	3.967
Inlet Temp. (deg. C)	90.5	64.1	50.8	38.5	34.1	31.5
Outlet Temp. (deg. C)	112	77.9	64.1	50.8	39	34.1
Temp. Rise (deg. C)	21.5	13.8	13.3	12.3	4.9	2.6
Flashing Temp. (deg. C)	114	82.4	69.4	56.3	42.1	37.2
Heat Transfer Rate (KJ/S)	154.832	98.535	94.653	87.292	99.939	52.999
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	8.726	9.837	10.594	10.473	5.169	4.269
U (KW/sq.m/K)	3.798	5.171	4.613	4.303	3.902	2.505
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0069	-0.0027	0.0207	0.0363	0.0602	0.2031

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 17, 94

Time: 16:00

Total Operation Time: 44 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.954	3.941	3.930	3.969	3.966
Inlet Temp. (deg. C)	90.5	63.6	50.4	38.1	34	31
Outlet Temp. (deg. C)	112	77.4	63.6	50.4	38.5	34
Temp. Rise (deg. C)	21.5	13.8	13.2	12.3	4.5	3
Flashing Temp. (deg. C)	114.5	81	68.7	56	41.9	37
Heat Transfer Rate (kJ/s)	154.832	98.522	93.932	87.285	91.777	61.150
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.506	8.759	10.331	10.585	5.338	4.328
U (kW/sq.m/K)	3.486	5.807	4.694	4.257	3.470	2.851
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.0304	-0.0239	0.0170	0.0388	0.0921	0.1547

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 17, 94

Time: 20:00

Total Operation Time: 48 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.989	3.968	3.954	3.941	3.930	3.969	3.966
Inlet Temp. (deg. C)	90.5	77.4	63.5	50.3	37.9	34	30.5
Outlet Temp. (deg. C)	112	90.5	77.4	63.5	50.3	38	34
Temp. Rise (deg. C)	21.5	13.1	13.9	13.2	12.4	4	3.5
Flashing Temp. (deg. C)	114	92.8	81.1	68.9	56	41.8	36.9
Heat Transfer Rate (kJ/s)	154.832	93.861	99.235	93.930	87.992	81.576	71.339
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)	8.726	6.889	8.913	10.673	10.732	5.562	4.421
U (kW/sq. m/K)	3.798	7.033	5.748	4.543	4.233	2.959	3.256
Clean-U Value (kW/sq. m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq. m K/kW)	0.0069	-0.0093	-0.0221	0.0240	0.0402	0.1418	0.1111

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 18, 94

Time: 00:00

Total Operation Time: 52 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 6	# 6	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/K)	3.989	3.954	3.941	3.930	3.969	3.969	3.966	3.966	
Inlet Temp. (deg. C)	90.5	63.4	50.1	37.7	33.9	30	30	30	
Outlet Temp. (deg. C)	112	77.3	63.4	50.1	38	33.9	33.9	33.9	
Temp. Rise (deg. C)	21.5	13.9	13.3	12.4	4.1	4.1	3.9	3.9	
Flashing Temp. (deg. C)	114.5	81.9	68.7	55.8	41.7	36.8	36.8	36.8	
Heat Transfer Rate (kJ/s)	154.852	99.233	94.638	87.988	83.615	79.488	79.488	79.488	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	9.506	9.988	10.594	10.732	5.498	4.576	4.576	4.576	
U (kW/sq.m/K)	3.486	5.129	4.612	4.233	3.069	3.505	3.505	3.505	
Clean-U value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/kW)	0.0304	-0.0011	0.0207	0.0402	0.1297	0.1297	0.0892	0.0892	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 18, 94

Time: 04:00

Total Operation Time: 56 hr.

Variables	Brine Heater			Evaporator Stages		
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.989	3.954	3.941	3.930	3.969	3.966
Inlet Temp. (deg. C)	90.5	63.7	50.2	37.8	33.9	30.5
Outlet Temp. (deg. C)	112	77.5	63.7	50.2	38	33.9
Temp. Rise (deg. C)	21.5	13.8	13.5	12.4	4.1	3.4
Flashing Temp. (deg. C)	115	81.2	68.8	56	41.8	36.8
Heat Transfer Rate (K/S)	154.832	98.525	96.066	87.990	83.615	69.300
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	10.238	8.881	10.433	10.843	5.602	4.582
U (KW/sq.m/K)	3.237	5.727	4.753	4.189	3.012	3.191
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0525	-0.0215	0.0143	0.0426	0.1359	0.1173

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 18, 94 Time: 08:00 Total Operation Time: 60 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.989	3.954	3.941	3.941	3.930	3.969	3.967
Inlet Temp. (deg. C)	90.5	63.8	50.5	50.5	38.2	34.1	31.5
Outlet Temp. (deg. C)	112	77.6	63.8	63.8	50.5	39	34.1
Temp. Rise (deg. C)	21.5	12.9	13.3	13.3	12.3	4.9	2.6
Flashing Temp. (deg. C)	115	93.4	81.7	69.1	56.3	42.1	37
Heat Transfer Rate (KJ/S)	154.832	92.430	98.527	94.647	87.287	99.939	52.999
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)	10.238	7.609	9.363	10.594	10.808	5.169	4.062
U (KW/sq.m/K)	3.237	6.271	5.432	4.612	4.169	3.902	2.633
Clean-U Value (KW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0525	0.0079	-0.0120	0.0207	0.0438	0.0602	0.1838

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 18, 94 Time: 12:00 Total Operation Time: 64 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.988	3.953	3.941	3.930	3.969	3.966
Inlet Temp. (deg. C)	90	62.8	49.7	37.4	33.8	31
Outlet Temp. (deg. C)	112	76.6	62.8	49.7	38	33.8
Temp. Rise (deg. C)	22	13.8	13.1	12.3	4.2	2.8
Flashing Temp. (deg. C)	115.5	80.8	68.3	55.6	41.6	36.8
Heat Transfer Rate (kJ/s)	158.420	98.503	93.204	87.272	85.654	57.072
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	11.078	9.483	10.752	10.919	5.432	4.247
U (kW/sq.m/°C)	3.061	5.363	4.475	4.126	3.182	2.712
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.0703	-0.0096	0.0274	0.0463	0.1182	0.1727

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 18, 94 Time: 16:00 Total Operation Time: 68 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/K)	3.988	3.954	3.941	3.930	3.969	3.966	3.966	3.966	
Inlet Temp. (deg. C)	90	63.1	50	37.7	33.9	31	31	31	
Outlet Temp. (deg. C)	112	76.9	63.1	50	38	33.9	33.9	33.9	
Temp. Rise (deg. C)	22	13.8	13.1	12.3	4.1	2.9	2.9	2.9	
Flashing Temp. (deg. C)	116	81	68.7	56	41.9	36.8	36.8	36.8	
Heat Transfer Rate (kJ/s)	158.420	98.510	93.211	87.278	85.615	59.111	59.111	59.111	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	11.753	9.363	10.865	11.030	5.707	4.184	4.184	4.184	
U (kW/sq.m/K)	2.885	5.431	4.429	4.085	2.957	2.851	2.851	2.851	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/kW)	0.0902	-0.0120	0.0297	0.0487	0.1421	0.1547	0.1547	0.1547	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 18, 94

Time: 20:00

Total Operation Time: 72 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.968	3.954	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	90	76.9	63	49.8	37.5	33.5	31
Outlet Temp. (deg. C)	112	90	76.9	63	49.8	38	33.5
Temp. Rise (deg. C)	22	13.1	13.9	13.2	12.3	4.5	2.5
Flashing Temp. (deg. C)	116	92.5	80.7	68.5	55.8	41.6	36.4
Heat Transfer Rate (kJ/s)	158.420	93.848	99.223	93.919	87.274	91.770	50.956
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	7.155	9.034	10.786	11.030	5.549	4.021
U (kW/sq.m/K)	2.885	6.772	5.670	4.495	4.085	3.337	2.557
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.0902	-0.0038	-0.0197	0.0264	-0.0487	0.1036	0.1950

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 19, 94

Time: 00:00

Total Operation Time: 76 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (Kj/kg/K)	3.988	3.954	3.941	3.930	3.968	3.968	3.968	3.966	
Inlet Temp. (deg. C)	90	63.4	50	37.4	33.5	30.5	30.5	30.5	
Outlet Temp. (deg. C)	112	77.2	63.4	50	37.5	33.5	33.5	33.5	
Temp. Rise (deg. C)	22	13.8	13.4	12.6	4	3	3	3	
Flashing Temp. (deg. C)	116	81.4	68.9	55.9	41.5	36.5	36.5	36.5	
Heat Transfer Rate (Kj/S)	158.420	98.517	95.348	89.404	81.570	61.145	61.145	61.145	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	11.753	9.483	10.855	11.025	5.771	4.328	4.328	4.328	
U (KW/sq.m/K)	2.885	5.364	4.535	4.186	2.852	2.851	2.851	2.851	
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.0902	-0.0096	0.0244	0.0428	0.1545	0.1547	0.1547	0.1547	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 19, 94

Time: 04:00

Total Operation Time: 80 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.988	3.968	3.954	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	90	76.8	63.1	49.8	37.2	33.3	30
Outlet Temp. (deg. C)	112	90	76.8	63.1	49.8	37.5	33.3
Temp. Rise (deg. C)	22	13.2	13.7	13.3	12.6	4.2	3.3
Flashing Temp. (deg. C)	116	92.4	81.3	69	55.9	41.4	36.3
Heat Transfer Rate (kJ/S)	158.420	94.563	97.795	94.632	89.400	85.647	67.256
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	7.052	9.804	11.272	11.248	5.746	4.448
U (kW/sq.m/K)	2.885	6.923	5.150	4.334	4.103	3.008	3.051
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0902	-0.0071	-0.0019	0.0346	0.0476	0.1364	0.1316

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 19, 94

Time: 08:00

Total Operation Time: 84 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (Kj/kg/K)	3.988	3.954	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	90	63.3	50	37.5	33.2	30
Outlet Temp. (deg. C)	112	77.1	63.3	50	37.5	33.2
Temp. Rise (deg. C)	22	13.8	13.3	12.5	4.3	3.2
Flashing Temp. (deg. C)	116	82.4	69.3	56.3	41.6	36.2
Heat Transfer Rate (kJ/S)	158.420	98.515	94.636	88.695	87.685	65.218
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	11.753	10.765	11.384	11.433	5.995	4.408
U (KW/sq.m/K)	2.885	4.725	4.292	4.005	2.951	2.986
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0902	0.0156	0.0369	0.0536	0.1427	0.1389

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 19, 94

Time: 12:00

Total Operation Time: 88 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.954	3.941	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	90	63.5	50.3	50.3	37.9	33.4	30.5
Outlet Temp. (deg. C)	112	77.2	63.5	63.5	50.3	38	33.4
Temp. Rise (deg. C)	22	13.7	13.2	13.2	12.4	4.6	2.9
Flashing Temp. (deg. C)	117	82.5	69.6	69.6	56.6	41.8	36.5
Heat Transfer Rate (kJ/s)	158.420	97.805	93.930	93.930	87.992	93.808	59.107
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)	13.046	10.751	11.460	11.460	11.397	5.799	4.392
U (kW/sq.m/K)	2.599	4.706	4.231	4.231	3.986	3.264	2.716
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.1283	0.0164	0.0403	0.0403	0.0548	0.1103	0.1721

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 19, 94 Time: 16:00 Total Operation Time: 92 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.953	3.941	3.941	3.930	3.968	3.968
Inlet Temp. (deg. C)	90	63	49.8	49.8	37.3	33.4	30.5
Outlet Temp. (deg. C)	112	76.8	63	63	49.8	37.5	33.4
Temp. Rise (deg. C)	22	13.2	13.8	13.2	12.5	4.1	2.9
Flashing Temp. (deg. C)	117	93.6	82	69.2	56.2	41.5	35.9
Heat Transfer Rate (KJS)	158.420	98.507	93.919	93.919	88.691	83.608	59.107
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)	13.046	8.569	10.650	11.572	11.543	5.811	3.766
U (KW/sq.m/K)	2.599	5.697	4.775	4.190	3.967	2.903	3.167
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.1283	0.0240	0.0133	0.0426	0.0560	0.1483	0.1196

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 19, 94 Time: 20:00 Total Operation Time: 96 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.953	3.941	3.950	3.968	3.966
Inlet Temp. (deg. C)	90	63	49.7	37.1	33.3	29.5
Outlet Temp. (deg. C)	112	76.8	63	49.7	37	33.3
Temp. Rise (deg. C)	22	13.8	13.3	12.6	3.7	3.8
Flashing Temp. (deg. C)	117.5	82	69.2	56.1	41.5	35.9
Heat Transfer Rate (kJ/s)	158.420	98.507	94.629	89.398	75.448	77.444
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	13.669	10.650	11.607	11.579	6.166	4.219
U (kW/sq.m/K)	2.480	4.775	4.209	3.986	2.469	3.705
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.1467	0.0133	0.0415	0.0548	0.2089	0.0739

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 20, 94 Time: 00:00 Total Operation Time: 100 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.988	3.953	3.941	3.941	3.950	3.968	3.966
Inlet Temp. (deg. C)	90	76.6	63	49.6	37	33.2	30
Outlet Temp. (deg. C)	112	90	76.6	63	49.6	37	33.2
Temp. Rise (deg. C)	22	13.4	13.6	13.4	12.6	3.8	3.2
Fashing Temp. (deg. C)	117	93.3	82.1	69.3	55.9	41.3	35.8
Heat Transfer Rate (kJ/s)	158.420	95.993	97.077	95.340	89.396	77.487	65.218
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)	13.046	8.264	10.924	11.754	11.469	6.001	3.988
U (kW/sq.m/°C)	2.599	5.997	4.588	4.188	4.024	2.606	3.300
Clean-U Value (kW/sq.m/°C)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.1283	0.0152	0.0219	0.0427	0.0524	0.1877	0.1070

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 20, 94

Time: 04:00

Total Operation Time: 104 hr.

Variables	Brine Heater			Evaporator Stages						
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.988	3.988	3.988	3.968	3.968	3.968	3.968	3.968	3.968
Inlet Temp. (deg. C)	90	90	90	90	33.1	33.1	33.1	33.1	33.1	33.1
Outlet Temp. (deg. C)	112	112	112	112	49.5	49.5	49.5	49.5	49.5	49.5
Temp. Rise (deg. C)	22	22	22	22	12.5	12.5	12.5	12.5	12.5	12.5
Flashing Temp. (deg. C)	117	117	117	117	56	56	56	56	56	56
Heat Transfer Rate (KJ/S)	158.420	158.420	158.420	158.420	88.686	88.686	88.686	88.686	88.686	88.686
Heat Transfer Area (sq. m)	4.6723	4.6723	4.6723	4.6723	1.937	1.937	1.937	1.937	1.937	1.937
L.M.T.D. (deg. K)	13.046	13.046	13.046	13.046	5.616	5.616	5.616	5.616	5.616	5.616
U (kW/sq. m/K)	2.599	2.599	2.599	2.599	3.224	3.224	3.224	3.224	3.224	3.224
Clean-U Value (kW/sq. m/K)	3.9	3.9	3.9	3.9	5.1	5.1	5.1	5.1	5.1	5.1
f (sq. m K/kW)	0.1283	0.1283	0.1283	0.1283	0.0584	0.0584	0.0584	0.0584	0.0584	0.0584

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 20, 94 Time: 08:00 Total Operation Time: 108 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/°C)	3.988	3.953	3.940	3.930	3.968	3.968	3.968	3.966	
Inlet Temp. (deg. C)	89.5	62.7	49.6	37	33.1	30	30	30	
Outlet Temp. (deg. C)	112	76.4	62.7	49.6	37	33.1	33.1	33.1	
Temp. Rise (deg. C)	22.5	13.7	13.1	12.6	3.9	3.1	3.1	3.1	
Flashing Temp. (deg. C)	118	82.2	69.4	56.3	41.5	35.8	35.8	35.8	
Heat Transfer Rate (kJ/s)	162.008	97.785	93.202	89.396	79.525	63.179	63.179	63.179	
Heat Transfer Area (Sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. C)	14.440	11.298	12.090	11.909	6.248	4.054	4.054	4.054	
U (kW/sq.m/°C)	2.401	4.468	3.980	3.875	2.568	3.145	3.145	3.145	
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (Sq.m K/kW)	0.1600	0.0277	0.0552	0.0620	0.1933	0.1219	0.1219	0.1219	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 20, 94

Time: 12:00

Total Operation Time: 112 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/hr)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.954	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	89.5	63.3	50.2	37.9	33.6	30.5
Outlet Temp. (deg. C)	112	76.7	63.3	50.2	37.5	33.6
Temp. Rise (deg. C)	22.5	13.4	13.1	12.3	3.9	3.1
Flashing Temp. (deg. C)	118.5	82.3	69.8	56.8	42.1	36.3
Heat Transfer Rate (KJ/S)	162.008	95.655	93.215	87.281	79.531	63.184
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.045	10.969	11.869	11.691	6.352	4.054
U (KW/sq.m/K)	2.305	4.502	4.055	3.854	2.527	3.145
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.1775	0.0260	0.0506	0.0634	0.1997	0.1219

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 20, 94 Time: 16:00 Total Operation Time: 116 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.967	3.954	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	89.5	65.2	50.1	37.6	33.5	29.5
Outlet Temp. (deg. C)	112	76.7	63.2	50.1	37.5	33.5
Temp. Rise (deg. C)	22.5	13.5	13.1	12.5	4	4
Flashing Temp. (deg. C)	118.5	82.5	69.8	57	42.2	36.3
Heat Transfer Rate (kJ/S)	162.008	96.367	93.213	88.697	81.570	81.521
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. C)	15.045	11.229	11.979	12.092	6.496	4.508
U (kW/sq.m/°C)	2.305	4.431	4.017	3.787	2.534	3.649
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.1775	0.0296	0.0529	0.0680	0.1986	0.0780

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 20, 94

Time: 20:00

Total Operation Time: 120 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/hr)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.988	3.967	3.953	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	89.5	76.7	63.1	49.8	37.4	33.4	29.5
Outlet Temp. (deg. C)	112	89.5	76.7	63.1	49.8	37.5	33.4
Temp. Rise (deg. C)	22.5	12.8	13.6	13.3	12.4	4.1	3.9
Flashing Temp. (deg. C)	118	93.6	82.8	69.5	56.5	41.9	36.1
Heat Transfer Rate (kJ/S)	162.008	91.689	97.080	94.652	87.983	83.608	79.483
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)	14.440	9.037	11.601	11.829	11.837	6.227	4.363
U (kW/sq.m/K)	2.401	5.238	4.320	4.130	3.837	2.710	3.676
Clean-U Value (kW/sq.m/K)	3.9	6.6	5.1	5.1	5.1	5.1	5.1
F (sq.m K/kW)	0.1600	0.0394	0.0354	0.0461	0.0645	0.1730	0.0760

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 21, 94

Time: 00:00

Total Operation Time: 124 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (KJ/kg/K)	3.988	3.953	3.941	3.930	3.968	3.968	3.968	3.968	
Inlet Temp. (deg. C)	89.5	63	49.7	37.3	33.3	33.3	30	30	
Outlet Temp. (deg. C)	112	76.6	63	49.7	38	38	33.3	33.3	
Temp. Rise (deg. C)	22.5	13.6	13.3	12.4	4.7	4.7	3.3	3.3	
Flashing Temp. (deg. C)	117.5	82.7	69.6	56.5	41.9	41.9	36.1	36.1	
Heat Transfer Rate (k/s)	162.008	97.077	94.629	87.981	95.847	95.847	67.256	67.256	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	13.825	11.601	12.051	11.946	5.943	5.943	4.238	4.238	
U (kW/sq.m/K)	2.508	4.320	4.054	3.802	3.254	3.254	3.202	3.202	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.1423	0.0354	0.0506	0.0669	0.1112	0.1112	0.1162	0.1162	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 21, 94

Time: 04:00

Total Operation Time: 128 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	6500	6500	18500	18500	
Specific Heat (kJ/kg/K)	3.988	3.953	3.940	3.929	3.968	3.966			
Inlet Temp. (deg. C)	89.5	62.7	49.4	37	33	29.5			
Outlet Temp. (deg. C)	112	76.4	62.7	49.4	37.5	33			
Temp. Rise (deg. C)	22.5	13.7	13.3	12.4	4.5	3.5			
Flashing Temp. (deg. C)	118	82.5	69.2	56.2	41.5	35.8			
Heat Transfer Rate (kJ/s)	162.008	97.785	94.623	87.976	91.762	71.328			
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556			
L.M.T.D. (deg. K)	14.440	11.636	11.940	11.946	5.970	4.316			
U (kW/sq.m/K)	2.401	4.339	4.091	3.802	3.102	3.335			
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1			
f (sq.m K/kW)	0.1600	0.0344	0.0483	0.0669	0.1263	0.1038			

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 21, 94

Time: 08:00

Total Operation Time: 132 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.953	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	89.5	62.9	49.6	37.1	33	30.5
Outlet Temp. (deg. C)	112	76.5	62.9	49.6	37	33
Temp. Rise (deg. C)	22.5	13.6	13.3	12.5	4	2.5
Flashing Temp. (deg. C)	117.5	81.9	69.4	56.4	41.5	35.7
Heat Transfer Rate (kJ/s)	162.008	97.075	94.627	88.688	81.564	50.953
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	13.825	10.810	11.940	11.983	6.289	3.814
U (kW/sq.m/K)	2.508	4.636	4.091	3.821	2.617	2.696
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.1423	0.0196	0.0483	0.0656	0.1861	0.1749

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 21, 84 Time: 12:00 Total Operation Time: 136 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.988	3.953	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	89.5	63.2	50.1	37.6	33.4	30.5
Outlet Temp. (deg. C)	112	76.6	63.2	50.1	37.5	33.4
Temp. Rise (deg. C)	22.5	13.4	13.1	12.5	4.1	2.9
Flashing Temp. (deg. C)	118	82.9	70.1	56.8	42	36.2
Heat Transfer Rate (kJ/S)	162,008	95,652	93,213	88,697	83,608	59,107
Heat Transfer Area (sq.m)	4,6723	1,937	1,937	1,937	4,9556	4,9556
L.M.T.D. (deg. K)	14,440	11,754	12,310	11,873	6,330	4,080
U (kW/sq.m/°C)	2,401	4,201	3,909	3,857	2,665	2,924
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.1600	0.0419	0.0597	0.0632	0.1791	0.1460

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 21, 94

Time: 16:00

Total Operation Time: 140 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.953	3.941	3.950	3.968	3.966
Inlet Temp. (deg. C)	89.5	63	49.9	37.5	33.3	29.5
Outlet Temp. (deg. C)	112	76.6	63	49.9	37	33.3
Temp. Rise (deg. C)	22.5	13.6	13.1	12.4	3.7	3.8
Flashing Temp. (deg. C)	118	82.9	70	56.7	41.9	36.2
Heat Transfer Rate (KJ/S)	162.008	97.077	93.208	87.985	75.448	77.444
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	14.440	11.824	12.419	11.946	6.577	4.538
U (KW/sq.m/K)	2.401	4.238	3.875	3.802	2.315	3.444
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.1600	0.0399	0.0620	0.0669	0.2359	0.0943

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 21, 94

Time: 20:00

Total Operation Time: 144 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/°C)	3.988	3.988	3.940	3.929	3.968	3.968	3.966	3.966	
Inlet Temp. (deg. C)	89.5	76.3	49.5	37	33.1	29	29	29	
Outlet Temp. (deg. C)	112	76.3	62.7	49.5	37	33.1	33.1	33.1	
Temp. Rise (deg. C)	22.5	13.2	13.2	12.5	3.9	4.1	4.1	4.1	
Flashing Temp. (deg. C)	118	82	69.3	56.4	41.6	35.8	35.8	35.8	
Heat Transfer Rate (kJ/s)	162.008	97.070	93.913	88.686	79.525	83.554	83.554	83.554	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. K)	14.440	11.151	12.015	12.092	6.352	4.439	4.439	4.439	
U (kW/sq.m/K)	2.401	4.494	4.035	3.786	2.526	3.798	3.798	3.798	
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.1600	0.0264	0.0517	0.0680	0.1997	0.0672	0.0672	0.0672	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 22, 94

Time: 00:00

Total Operation Time: 148 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/°C)	3.988	3.953	3.940	3.929	3.968	3.968
Inlet Temp. (deg. C)	89.5	62.6	49.4	36.9	32.9	29
Outlet Temp. (deg. C)	112	76.1	62.6	49.4	37	32.9
Temp. Rise (deg. C)	22.5	13.5	13.2	12.5	4.1	3.9
Flashing Temp. (deg. C)	119	81.9	69.3	56.3	41.5	35.7
Heat Transfer Rate (kJ/s)	162.008	96.353	93.910	88.664	83.602	79.477
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.642	11.229	12.126	12.092	6.330	4.470
U (kW/sq.m/°C)	2.217	4.430	3.998	3.786	2.665	3.568
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.1947	0.0297	0.0540	0.0680	0.1792	0.0826

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 22, 94

Time: 04:00

Total Operation Time: 152 hr.

Variables	Brine Heater			Evaporator Stages		
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (kJ/kg/K)	3.988	3.953	3.941	3.930	3.968	3.966
Inlet Temp. (deg. C)	89.5	63	49.6	37	32.9	29
Outlet Temp. (deg. C)	112	76.6	63	49.6	37.5	32.9
Temp. Rise (deg. C)	22.5	13.6	13.4	12.6	4.6	3.9
Flashing Temp. (deg. C)	119	82.2	69.6	56.4	41.6	35.7
Heat Transfer Rate (KJ/S)	162.008	97.077	95.340	89.396	93.801	79.477
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	15.642	11.038	12.087	12.019	6.114	4.470
U (KW/sq.m/K)	2.217	4.541	4.072	3.840	3.096	3.588
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.1947	0.0242	0.0495	0.0643	0.1269	0.0826

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 22, 94 Time: 08:00 Total Operation Time: 156 hr.

Variables	Brine Heater			Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500	18500	18500	
Specific Heat (kJ/kg/°C)	3.988	3.953	3.940	3.929	3.968	3.968	3.968	3.968	
Inlet Temp. (deg. C)	89.5	62.7	49.2	36.6	32.5	30	30	30	
Outlet Temp. (deg. C)	112	76.3	62.7	49.2	37	32.5	32.5	32.5	
Temp. Rise (deg. C)	22.5	13.6	13.5	12.6	4.5	4.5	2.5	2.5	
Flashing Temp. (deg. C)	119	80.9	68.9	56	41	41	35.3	35.3	
Heat Transfer Rate (kJ/s)	162.008	97.070	96.044	89.389	91.755	50.949	50.949	50.949	
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556	4.9556	4.9556	
L.M.T.D. (deg. C)	15.642	9.888	11.678	12.019	5.970	3.918	3.918	3.918	
U (kW/sq.m/°C)	2.217	5.068	4.246	3.840	3.101	2.624	2.624	2.624	
Clean-U Value (kW/sq.m/°C)	3.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
f (sq.m K/KW)	0.1947	0.0012	0.0394	0.0644	0.1264	0.1850	0.1850	0.1850	

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 22, 94

Time: 16:00

Total Operation Time: 164 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.954	3.942	3.931	3.968	3.965
Inlet Temp. (deg. C)	90	64.1	51.3	39.1	32.1	29.5
Outlet Temp. (deg. C)	112	77.1	64.1	51.3	37	32.1
Temp. Rise (deg. C)	22	13	12.8	12.2	4.9	2.6
Flashing Temp. (deg. C)	117.8	82.4	70.3	57.7	41.9	38.3
Heat Transfer Rate (kJ/s)	158.420	92.813	91.100	86.592	99.908	52.983
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	14.038	10.491	11.430	11.435	7.069	7.424
U (kW/sq.m/K)	2.415	4.567	4.115	3.909	2.852	1.440
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.1576	0.0229	0.0469	0.0597	0.1546	0.4983

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 22, 94 Time: 20:00 Total Operation Time: 168 hr.

Variables	Evaporator Stages						
	Brine Heater	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.954	3.942	3.942	3.931	3.965	3.965
Inlet Temp. (deg. C)	90	64.1	51.3	51.3	39.1	30.6	29
Outlet Temp. (deg. C)	112	77.1	64.1	64.1	51.3	36	30.6
Temp. Rise (deg. C)	22	13	12.8	12.8	12.2	5.4	1.6
Flashing Temp. (deg. C)	116	82.5	70.7	70.7	57.8	40.7	38.4
Heat Transfer Rate (kJ/S)	158.420	92.813	91.100	91.100	86.592	110.083	32.601
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	10.604	11.872	11.872	11.545	7.059	8.575
U (kW/sq.m/K)	2.885	4.519	3.962	3.962	3.872	3.147	0.767
Clean-U Value (kW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1	5.1
f (sq.m K/kW)	0.0902	0.0252	0.0563	0.0563	0.0622	0.1217	1.1074

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 23, 94

Time: 00:00

Total Operation Time: 172 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.955	3.943	3.932	3.967	3.965
Inlet Temp. (deg. C)	90	64.8	52.2	40.2	30.9	28.5
Outlet Temp. (deg. C)	112	77.8	64.8	52.2	35.5	30.9
Temp. Rise (deg. C)	22	13	12.6	12	4.6	2.4
Flashing Temp. (deg. C)	114.5	83.8	71.6	58.6	41.5	38.4
Heat Transfer Rate (KJ/S)	158.420	92.830	89.693	85.191	93.773	48.900
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	9.639	11.278	12.019	11.363	8.083	8.645
U (KW/sq.m/K)	3.518	4.249	3.853	3.870	2.341	1.141
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0279	0.0393	0.0635	0.0623	0.2311	0.6800

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1

Date: October 23, 94

Time: 04:00

Total Operation Time: 176 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.955	3.943	3.932	3.967	3.965
Inlet Temp. (deg. C)	90	64.9	52.1	40.1	30.5	28.5
Outlet Temp. (deg. C)	112	77.9	64.9	52.1	35.5	30.5
Temp. Rise (deg. C)	22	13	12.8	12	5	2
Flashing Temp. (deg. C)	115	83	71.4	58.4	41	38
Heat Transfer Rate (kJ/s)	158.420	92.832	91.117	85.189	101.924	40.749
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	10.376	10.263	11.761	11.253	7.732	8.461
U (KW/sq.m/K)	3.268	4.670	4.000	3.908	2.660	0.972
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0496	0.0347	0.0540	0.0598	0.1799	0.8328

CALCULATIONS OF OVERALL HEAT TRANSFER COEFFICIENT AND FOULING FACTOR

Run No. 5-1 Date: October 23, 94 Time: 08:00 Total Operation Time: 180 hr.

Variables	Evaporator Stages					
	# 1	# 2	# 3	# 4	# 5	# 6
Flowrate (kg/h)	6500	6500	6500	6500	18500	18500
Specific Heat (KJ/kg/K)	3.988	3.955	3.943	3.932	3.967	3.965
Inlet Temp. (deg. C)	90	64.9	52.1	40.1	30.5	28.5
Outlet Temp. (deg. C)	112	77.9	64.9	52.1	35.5	30.5
Temp. Rise (deg. C)	22	13	12.8	12	5	2
Flashing Temp. (deg. C)	115	83	71.4	58.4	41	38
Heat Transfer Rate (KJ/s)	158.420	92.832	91.117	85.189	101.924	40.749
Heat Transfer Area (sq.m)	4.6723	1.937	1.937	1.937	4.9556	4.9556
L.M.T.D. (deg. K)	10.376	10.263	11.761	11.253	7.732	8.461
U (KW/sq.m/K)	3.268	4.670	4.000	3.908	2.660	0.972
Clean-U Value (KW/sq.m/K)	3.9	5.1	5.1	5.1	5.1	5.1
f (sq.m K/KW)	0.0496	0.0181	0.0540	0.0598	0.1799	0.8528

