

PY 1987
 LA Eng
 AN CA108(2):10910j
 AB Design and economics of hybrid seawater desalination plants using multiple stage flash evapn. and reverse osmosis are described and discussed.

L16 ANSWER 12 OF 23 COPYRIGHT 1991 ACS
 AN CA107(8):61946n
 TI Simultaneous production of desalinated water and power using a hybrid-cycle OTEC plant
 AU Panchal, C. B.; Bell, K. J.
 CS Argonne Natl. Lab.
 LO Argonne, IL 60439, USA
 SO J. Sol. Energy Eng., 109(2), 156-60
 SC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 SX 61
 DT J
 CO JSEEDO
 IS 0199-6231
 PY 1987
 LA Eng
 AN CA107(8):61946n
 AB A systems study was done for simultaneous prodn. of desalinated water and elec. power using a hybrid-cycle 10-MW OTEC system (combination of open and closed-cycle). Design and plant operating criteria for adjusting the ratio of water prodn. to power generation is described, and their effects on the total system were evaluated.

L16 ANSWER 13 OF 23 COPYRIGHT 1991 ACS
 AN CA105(14):120136g
 TI Membrane-based hybrid processes for energy-efficient waste-water treatment
 AU Ray, Roderick J.; Kucera-Gienger, Jane; Retzlaff, Sandra
 CS Bend Res., Inc.
 LO Bend, OR 97701, USA
 SO J. Membr. Sci., 28(1), 87-106
 SC 60-3 (Waste Treatment and Disposal)
 DT J
 CO JMESDO
 IS 0376-7388
 PY 1986
 LA Eng
 AN CA105(14):120136g
 AB Two different membrane-based hybrid wastewater treatment processes for corn steep water, and the recycle of space-station wash waters are discussed. Lab. data used to design the membrane section of each of the hybrid processes is presented. These processes make use of a novel, fouling-resistant reverse-osmosis membrane module. Also included is a discussion of the criteria used for the design of the membrane-based hybrid processes for each application. The corn-steep-water treatment process was optimized using operating costs as the optimization variable. The space-station wash water recycle system, however, was optimized for min. launch and resupply penalties and for min. power requirements. The expected performance of each membrane-based hybrid process is compared with the performance of the conventional unit operation.

L16 ANSWER 14 OF 23 COPYRIGHT 1991 ACS
 AN CA105(14):118149v

TI Solar pond/fuel assisted water desalination plant
 AU Aly, S. E.
 CS King Abdulaziz Univ. Jeddah
 LO Jeddah, Saudi Arabia
 SO Waerme- Stoffuebertrag., 20(3), 263-8
 SC 52-3 (Electrochemical, Radiational, and Thermal Energy Technology)
 SX 48, 61, 69
 DT J
 CO WASBBW
 IS 0042-9929
 PY 1986
 LA Eng
 AN CA105(14):118149v
 AB A thermodyn. anal. of a hybrid solar pond/fuel-assisted generator-water desalination system shows that the plant can produce 70 kW shaft power with a basic efficiency of 15% and 200 ton/day fresh water. The plant concept has a power generation loop and a desalination loop that can operate sep. for power generation or can be combined to produce fresh water. The system design and component parameters are described.

L16 ANSWER 15 OF 23 COPYRIGHT 1991 ACS

AN CA104(6):39405b
 TI Hybrid desalting technology maximizes recovery
 AU Kohli, H.; Emmermann, D.; Kadaj, R.; Said, H.
 CS Envirogenics Syst. Co.
 LO El Monte, CA 91731, USA
 SO Desalination, 56, 61-8
 SC 61-4 (Water)
 DT J
 CO DSLNAH
 IS 0011-9164
 PY 1985
 LA Eng
 AN CA104(6):39405b
 AB A combination of reverse osmosis and distn. technologies is employed in a 51,000 m³/day treatment plant to obtain 99% recovery. The desalination plant is designed to minimize reject-brine flow rate due to constraints on brine discharge. The treatment scheme specified includes softening by pellet reactors, gravity sand filtration followed by desalination and evapn. pond. Possibilities of eliminating lined evapn. ponds for reject brine by concg. brine to dry solids and pretreatment options for future plants are discussed.

L16 ANSWER 16 OF 23 COPYRIGHT 1991 ACS

AN CA104(4):23999n
 TI Field trials of hybrid acid-additive treatment for control of scale in MSF plants
 AU Butt, F.; Rahman, F.; Al-Abdallah, A.; Al-Zahrani, H.; Maadhah, A.; Amin, M.
 CS Res. Inst., Univ. Pet. Miner.
 LO Dhahran 31261, Saudi Arabia
 SO Desalination, 54, 307-20
 SC 61-8 (Water)
 SX 56
 DT J
 CO DSLNAH
 IS 0011-9164
 PY 1985

LA Eng
AN CA104(4):23999n
AB Field trials of the additive-only (Albrivap-G [99627-90-4]) treatment and the hybrid (acid Albrivap DSB [99627-89-1]) treatment were carried out on an multistage flash (MSF) unit at 112.8 degree. top brine temp. The main objectives were to reduce the abnormally high frequency of acid cleaning with the existing additive treatment, and to test the techno-economic viability of the hybrid treatment. The economics and the corrosion and thermal performance of the hybrid treatment were outstanding: the period of operation between consecutive acid cleanings was increased from 19 days to .ltoreq.164 days (5 1/2 months) and the frequency of acid cleaning was thereby reduced from 7 to at most 1/yr of 5 1/2 operating months. The cost of scale control treatment was reduced by 50% and energy cost of the extn. steam was reduced by 11% resulting in considerable savings in the operating cost of the 3-unit MSF plant.

L16 ANSWER 17 OF 23 COPYRIGHT 1991 ACS

AN CA99(4):27723u

TI Reduction of nitrate concentration in drinking water by a hybrid process with zero discharge based on reverse osmosis

AU Van Opbergen, G.; Peters, T.; Rautenbach, R.; Tils, H.

CS Josef Van Opbergen

LO Neuss D-4040/22, Fed. Rep. Ger.

SO Desalination, 47, 267-74

SC 61-5 (Water)

SX 60

DT J

CO DSLNAH

IS 0011-9164

PY 1983

LA Eng

AN CA99(4):27723u

AB A hybrid process for removal of NO₃⁻ from well waters is based on reverse osmosis and solves the problem of the conc.-disposal by treating this conc. in a zero discharge system utilizing selective ion-exchange, electrodialysis and thin-film-evapn. A pilot-plant with a capacity of 50 m³/d permeate is under construction on the premises of a municipal waterworks. Special factors of interest are the reliability as well as the actual costs of such a process, the possibility of utilizing brine for the regeneration of the ion-exchanger, and the optimal concn. factors for every step of the process.

L16 ANSWER 18 OF 23 COPYRIGHT 1991 ACS

AN CA96(16):129475v

TI Desalination of sea water by an electrodialysis-reverse osmosis hybrid system

AU Schmoltdt, H.; Strathmann, H.; Kaschemekat, J.

CS Forschungsinst., Berghof G.m.b.H.

LO Tuebingen, Fed. Rep. Ger.

SO Water, Essence Life, Proc. Int. Congr. Desalin. Water Re-use, Volume 1, 567-82. Edited by: Bakish, Robert. Int. Desalin. Environ. Assoc.: Teaneck, N. J.

SC 61-4 (Water)

DT C

CO 47IAA7

PY 1981

LA Eng

AN CA96(16):129475v

AB Seawater desalination by a 2-stage reverse osmosis-electrodialysis system has a small economic advantage over 2-stage reverse osmosis seawater desalination. Significant cost savings would result from using reverse osmosis membranes with a high flux and lower salt rejection but with low compaction values, with possible earlier switchover to the less costly electrodialysis process.

L16 ANSWER 19 OF 23 COPYRIGHT 1991 ACS

AN CA96(8):57497d

TI Combined MSF/VTE-modules for hybrid thermal seawater desalination plants

AU Hapke, J.; Uckermann, B.

CS Univ. Dortmund

LO Dortmund 4600, Fed. Rep. Ger.

SO Desalination, 39(1-2-3), 373-84

SC 61-4 (Water)

DT J

CO DSLNAH

IS 0011-9164

PY 1981

LA Eng

AN CA96(8):57497d

AB The design of combined MSF/VTE-modules for seawater desalination plants is described. A computer-aided model for the detn. of the mass and energy balance as well as for the rating of heat exchanger surfaces was established. The heating-surface-rating is the basis of design studies for standardized modules.

L16 ANSWER 20 OF 23 COPYRIGHT 1991 ACS

AN CA96(6):40642z

TI Desalination of sea water by an electrodialysis-reverse osmosis hybrid system

AU Schmoldt, H.; Strathmann, H.; Kaschemekat, J.

CS Forschungsinst. Berghof GmbH

LO Tuebingen, Fed. Rep. Ger.

SO Desalination, 38(1-2-3), 567-82

SC 61-4 (Water)

DT J

CO DSLNAH

IS 0011-9164

PY 1981

LA Eng

AN CA96(6):40642z

AB In a reverse osmosis unit with 4 plate and frame membrane modules with membranes of different order fluxes and salt rejections with feedwater (4.5% NaCl soln.) salt concns. <45,000 ppm and hydrostatic pressures <80 bar, membranes with a high salt rejection had relatively low flux but also relatively small compaction values while those with low salt rejection had high flux and large compaction. A hybrid system of reverse osmosis-electrodialysis with a electrodialysis unit consisting of one stack with a total membrane area of 300 m² was more efficient than a 2-stage reverse osmosis system for desalination of seawater with a salt concn. of 45,000 ppm.

L16 ANSWER 21 OF 23 COPYRIGHT 1991 ACS

AN CA90(10):74319r

TI Hybrid cycle - ocean thermal energy conversion power desalting plant

AU Awerbuch, L.

CS Am. Embassy

LO Tel-Aviv, Israel
SO Proc. Int. Symp. Fresh Water Sea, 6(1), 347-56
SC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
SX 48, 61
DT J
CO PSFSDZ
IS 0378-2298
PY 1978
LA Eng
AN CA90(10):74319r
AB

In the title hybrid cycle, warm seawater is flashed in a barometric flash evaporator, the steam flows to the shell side of a double-fluted tube evaporator or the tube side of a horizontal spray film evaporator with the boiling of NH₃ and the prodn. of distd. water. The NH₃ vapor drives a turbogenerator and the exhausted NH₃ vapor is condensed in an indirect condenser by cold seawater and recycled. Flash and indirect evaporator designs, noncondensable gas removal, heat-transfer enhancement, temp. losses, and fouling are discussed.

L16 ANSWER 22 OF 23 COPYRIGHT 1991 ACS

AN CA86(22):160558s

TI Hybrid reverse osmosis - ultrafiltration membranes

AU Sachs, S. B.; Zisner, E.; Herscovici, G.; Shelef, G.

CS Israel Desalination Eng.

LO Tel-Aviv, Israel

SO Proc. Int. Symp. Fresh Water Sea, 4, 167-77

SC 60-1 (Sewage and Wastes)

SX 37

DT J

CO PSFSDZ

PY 1976

LA Eng

AN CA86(22):160558s

AB

Assym. non-cellulosic membranes having a intermediate performance between the reverse osmosis membrane and an ultrafilter have been developed. The main characteristics are high fluxes [4-10 m³/m² day at low pressure (6-10 atm)] and moderate rejections for various salts. From 200 mg/L solns. of NaNO₃, Na₂SO₄, and KH₂PO₄, rejections up to 40%, 70% and 90%, resp., were obtained. The new membranes can withstand large variations in pH (1-13) and have excellent chem. and biol. stability. The membranes have been tested in a mobile sewage ultrafiltration pilot plant operating on oxidn. pond effluent. High rejections for BOD, COD, bacteria and suspended solids as well as a 20% redn. in salinity have been obtained.

L16 ANSWER 23 OF 23 COPYRIGHT 1991 ACS

AN CA86(20):145218n

TI Hybrid reverse osmosis - ultrafiltration membranes

AU Sachs, S. B.; Zisner, E.; Herscovici, G.

CS Israel Desalination Eng.

LO Tel Aviv, Israel

SO Desalination, 18(2), 99-111

SC 60-2 (Sewage and Wastes)

DT J

CO DSLNAH

PY 1976

LA Eng

AN CA86(20):145218n

AB

A new group of asymmetric noncellulosic membranes having

performances intermediate between those of conventional reverse-osmosis membranes and ultrafilter is discussed. The chief characteristics of the membranes are high fluxes (4-10 m³/m²-day) at low pressures (6-10 atm) and moderate rejection for various salts. With 200 mg/L solns of NaNO₃, Na₂SO₄, and KH₂PO₄, rejections of 40%, 70%, and 90%, resp., were obtained. The new membranes can withstand large variations in pH (1-13) and have excellent chem. and biol. stability. In tests in a mobile sewage treatment pilot plant, operating on oxidn. pond effluent, high rejections for BOD, COD, bacteria, and suspended solids as well as a 20% redn. in salinity were obtained.

海水淡水化ハイブリッド法に関する文献

1. 使用データベース	DIALOG	
2. 検索期間		
3. 検索結果		件
6: NTIS_64-92/9201B1		27
8: COMPENDEX PLUS_1970-1991/NOV		51
40: ENVIROLINE_70-91/NOV		10
41: POLLUTION ABSTRACTS _ 70-91/NOV		10
44: AQUATIC SCIENCE ABSTRACTS _ 78-91/SEP		13
103: ENERGY SCIENCE & TECHNOLOGY_74-91/DEC(ISS23)		64
TOTAL: FILES 6,8,40 and ...		175
?RD S1		
.....S2.....	126	RD S1 (unique items)

重複を除く オンライン出力

UTC-80 高 Rej

ANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Simulation was made by: NITTO DENKO

12-27-91

Project name : NACL RO SYSTEM SIMULATION

Permeate flow : 29065 GPD

Water temperature : 20.0 C

Recovery : 35.0%

Water pH : 6.50

Element age : 0.0 years

Chemical dosage, ppm(100%) : 0.0 H2SO4

Flux decline coefficient : -0.035

Unmineralized feed CO2, ppm : 0.0

3-yr salt passage increase factor : 1.2

Pressure : 1052.9 psi

Concentrate Pressure : 1018.2 psi

Feed Flow	Conc.	Flow	Beta	Conc.	Element	Element	Array
Total Vessel	Total	Vessel		Press.	Type	No.	
gpm	gpm	gpm		psi			
57.7	37.5	37.5	1.06	1018.2	UTC-80-SW8"ELS	6	1x6

n	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	13760.0	29913.0	13760.0	29913.0	55.9	121.5	21139.1	45954.6
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	21240.0	29957.7	21240.0	29957.7	86.2	121.5	32630.5	46023.3
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35000.0		35000.0		142.1		53769.7		
6.5		6.5						

Units: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
Ca/Ksp*100,%	0.0	0.0	0.0
Mg/Ksp*100,%	0.0	0.0	0.0
Na/Ksp*100,%	0.0	0.0	0.0
sat.,%	0.0	0.0	0.0
silicic acid ind.	0.00	0.00	0.00
& Davis ind.	0.00	0.00	0.00
strength	0.62	0.62	0.97
osmotic press.,psi	407.2	407.2	638.0

(No 2) UTC-80 高Flux (UTC-80HF と仮定)

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-27-91

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 861.4 psi

Concentrate Pressure : 826.9 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.05	826.9	UTC-80HF-SW8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	155.1	337.2	21085.7	45838.5
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	239.1	337.2	32548.2	45907.2
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		394.2		53633.9	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw, water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	636.3

(No 3) SC-8000

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-27-91

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C

Recovery : 35.0%

Raw water pH : 6.50

Element age : 0.0 years

Acid dosage, ppm(100%): 0.0 H2SO4

Flux decline coefficient :

Acidified feed CO2, ppm : 0.0

3-yr salt passage increase factor : 1.2

Feed Pressure : 1096.2 psi

Concentrate Pressure : 1061.3 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	37.5	37.5	1.06	1061.3	SC-8000-SW8"S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	240.8	523.5	21039.6	45738.2
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	371.2	523.5	32477.1	45806.9
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		612.0		53516.6	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	634.8

No. 4-1, UTC-70

HYDRANAUTICS DESIGN PROGRAM -- VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-27-91

Project name : NACL ROSYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 779.4 psi

Concentrate Pressure : 745.8 psi

Pass	Feed Flow Total Vessel gpm	Conc. Flow Total Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	37.5	1.04	745.8	UTC-70-SW8"ELS	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	115.2	250.4	21107.2	45885.2
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	177.5	250.4	32581.3	45953.9
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		292.7		53688.5	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	637.0

No5. NTR-759SW

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-27-91

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor :1.2

Feed Pressure : 1063.4 psi

Concentrate Pressure : 1028.5 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.06	1028.5	NTR-759SWC-8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	61.6	134.0	21136.0	45947.9
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	95.0	134.0	32625.8	46016.6
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		156.7		53761.8	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	637.9

(No 6-1.) NTR-759HR

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-27-91

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 815.5 psi

Concentrate Pressure : 781.7 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	37.5	37.5	1.04	781.7	NTR-759HR-S8"S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	100.0	217.3	21115.4	45903.0
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	154.1	217.3	32593.9	45971.7
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		254.1		53709.3	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	637.2

(No. 6-2) NTR-759HR

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-27-91

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2, ppm : 0.0
 Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor : 1.2

Feed Pressure : 790.1 psi

Concentrate Pressure : 756.0 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.04	756.0	NTR-759HR-S8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	289.2	628.7	21013.5	45681.6
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	445.7	628.7	32436.9	45750.2
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		734.9		53450.4	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat. %	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	634.0

No. 1 - 37°C, UCT-80

HYDRANAUTICS DESIGN PROGRAM -- VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-28-91

Project name : NACL ROSYSTEM SIMURATION -2 Permeate flow : 29065 GPD
 Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 910.3 psi Concentrate Pressure : 875.7 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.05	875.7 UTC-80-SW8"ELS	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	82.9	180.2	21124.6	45923.1
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	127.7	180.2	32608.1	45991.7
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		210.6		53732.8	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	425.3	425.3	665.8

No 2, ~ 33°C UTC-80HF

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-28-91

Project name : NaCl RO SYSTEM SIMULATION -2 Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 796.6 psi Concentrate Pressure : 762.9 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.04	762.9 UTC-80HF-SW8"S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	233.0	506.4	21043.8	45747.4
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	359.0	506.4	32483.6	45816.1
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		592.0		53527.4	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	425.3	425.3	663.1

No3 - 37°C SC-8000

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-28-91

Project name : NACL RO SYSTEM SIMURATION -2 Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 939.5 psi Concentrate Pressure : 904.8 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.05	904.8	SC-8000-SW8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	356.5	774.9	20977.3	45602.8
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	549.4	774.9	32381.1	45671.5
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		905.9		53358.4	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	425.3	425.3	660.9

No 4-1, - 33°C UTC-70

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-28-91

Project name : NACL RO SYSTEM SIMURATION -2 Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 748.5 psi

Concentrate Pressure : 715.8 psi

Pass	Feed Flow Total Vessel gpm	Conc. Flow Total Vessel gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.02	715.8	UTC-70-SW8"ELS	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	173.8	377.8	21075.7	45816.6
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	267.8	377.8	32532.7	45885.3
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		441.6		53608.4	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	425.3	425.3	664.2

No5 -33° NTR-759SW

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-28-91

Project name : NaCl RO SYSTEM SIMURATION - 2 Permeate flow : 29065 GPD
 Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 923.0 psi Concentrate Pressure : 888.3 psi

Pass	Feed Flow Total gpm	Flow Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.05	888.3	NTR-759SWC-8"S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	91.6	199.2	21119.9	45912.8
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	141.2	199.2	32600.9	45981.5
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		232.9		53720.8	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	425.3	425.3	665.6

No. 6-1. at 33°C NTR-759HR

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-28-91

Project name : NACL RO SYSTEM SIMURATION -2

Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2,ppm : 0.0
 Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor :1.2

Feed Pressure : 770.4 psi

Concentrate Pressure : 737.4 psi

Pass	Feed Flow Total gpm	Feed Flow Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.03	737.4	NTR-759HR-S8"S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	150.3	326.7	21088.3	45844.2
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	231.6	326.7	32552.2	45912.8
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		381.9		53640.5	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	425.3	425.3	664.6

No 6-2 at 33°C NTR-759HR

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

12-28-91

Project name : NAEL RO SYSTEM SIMURATION -2 Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.2

Feed Pressure : 747.1 psi

Concentrate Pressure : 713.9 psi

Pass	Feed Flow Total Vessel gpm	Conc. Flow Total Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.03	713.9	NTR-759HR-S8"S 6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	442.3	961.5	20931.1	45502.3
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	681.7	961.5	32309.9	45571.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1124.0		53240.9	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	425.3	425.3	659.4

11/27 技術部

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

01-10-92

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2,ppm : 0.0
 Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor :1.5

Feed Pressure : 810.3 psi

Concentrate Pressure : 776.3 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.04	776.3	UTC-80HF-SW8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	276.0	599.9	21020.6	45697.0
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	425.4	599.9	32447.9	45765.7
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		701.3		53468.5	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	634.2

Project name : NACL RO SYSTEM SIMURATION Permeate flow : 29065 GPD
 Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor : 1.5

Feed Pressure : 887.6 psi Concentrate Pressure : 853.1 psi
 Pass Feed Flow Conc. Flow Beta Conc. Element Element Array
 Total Vessel Total Vessel Press. Type No.
 gpm gpm gpm psi
 1 57.7 57.7 37.5 37.5 1.05 853.1 UTC-80HR-SW8"S 6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	126.7	275.4	21101.0	45871.8
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	195.3	275.4	32571.0	45940.5
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		322.0		53672.8	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	636.8

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor :1.5

Feed Pressure : 1021.7 psi

Concentrate Pressure : 986.6 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.06	986.6	SC-8000-SW8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	442.7	962.4	20930.9	45501.9
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	682.3	962.4	32309.5	45570.5
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1125.0		53240.4	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	407.2	407.2	631.3

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor :1.5

Feed Pressure : 882.6 psi

Concentrate Pressure : 848.1 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.05	848.1	NTR-759SW-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	269.0	584.7	21024.4	45705.2
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	414.6	584.7	32453.7	45773.9
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		683.6		53478.1	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	634.3

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 20.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2, ppm : 0.0

Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor : 1.5

Feed Pressure : 807.4 psi

Concentrate Pressure : 773.5 psi

Pass	Feed Flow Total Vessel gpm	Conc. Flow Total Vessel gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.04	773.5	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	319.1	693.6	20997.4	45646.6
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	491.8	693.6	32412.1	45715.3
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		810.8		53409.6	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	407.2	407.2	633.5

HYDRANAUTICS DESIGN PROGRAM - VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

01-10-92

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 16500 GPD

Feedwater temperature : 33.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%) : 0.0 H2SO4
 Acidified feed CO2, ppm : 0.0

Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor : 1.5

Feed Pressure : 686.9 psi

Concentrate Pressure : 672.5 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	32.7	32.7	21.3	21.3	1.02	672.5	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	864.9	1880.1	20703.5	45007.7
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	1333.0	1880.1	31959.1	45076.4
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		2197.9		52662.7	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.95
Osmotic press.,psi	425.3	425.3	651.8

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 22800 GPD

Feedwater temperature : 33.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2, ppm : 0.0

Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor : 1.5

Feed Pressure : 712.0 psi

Concentrate Pressure : 688.6 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Flow Total Vessel gpm gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	45.2 45.2	29.4 29.4	1.02	688.6	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	610.8	1327.7	20840.4	45305.1
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	941.4	1327.7	32170.0	45373.8
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1552.1		53010.4	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	425.3	425.3	656.3

HYDRANAUTICS DESIGN PROGRAM -- VERSION 4.05 (1990)
 Calculation was made by: NITTO DENKO

01-10-92

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 16500 GPD

Feedwater temperature : 20.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor :1.5

Feed Pressure : 687.8 psi

Concentrate Pressure : 672.8 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	32.7 32.7	21.3	21.3	1.03	672.8	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	568.5	1235.8	20863.1	45354.6
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	876.2	1235.8	32205.1	45423.3
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1444.6		53068.3	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	407.2	407.2	629.2

Project name : NACL RO SYSTEM SIMULATION

Permeate flow : 16500 GPD

Feedwater temperature : 27.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2, ppm : 0.0

Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor : 1.5

Feed Pressure : 690.1 psi

Concentrate Pressure : 675.6 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	32.7	32.7	21.3	21.3	1.02	675.6	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	719.6	1564.3	20781.8	45177.7
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	1109.1	1564.3	32079.7	45246.4
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1828.7		52861.5	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.95
Osmotic press.,psi	416.9	416.9	641.6

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 0.0 3-yr salt passage increase factor : 1.5

Feed Pressure : 763.7 psi

Concentrate Pressure : 730.6 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.03	730.6	UTC-80HFSW8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	415.1	902.4	20945.7	45534.1
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	639.8	902.4	32332.4	45602.8
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1054.9		53278.1	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	425.3	425.3	659.8

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor : 1.5

Feed Pressure : 835.6 psi

Concentrate Pressure : 801.7 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.04	801.7	UTC-80HRSW8"S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	190.5	414.1	21066.7	45797.1
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	293.6	414.1	32518.8	45865.8
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		484.0		53585.5	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.97
Osmotic press.,psi	425.3	425.3	663.9

Project name : NACL RO SYSTEM SIMURATION Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor :1.5

Feed Pressure : 906.6 psi Concentrate Pressure : 872.2 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7 57.7	37.5	37.5	1.05	872.2	SC8000-SW8" S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	661.5	1438.0	20813.0	45245.8
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	1019.5	1438.0	32127.9	45314.4
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1681.0		52941.0	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	425.3	425.3	655.4

Project name : NACL RO SYSTEM SIMURATION Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor :1.5

Feed Pressure : 729.9 psi

Concentrate Pressure : 697.5 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7 57.7	37.5	37.5	1.02	697.5	UTC-70-SW8"S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	1025.2	2228.7	20617.2	44820.0
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	1580.1	2228.7	31826.1	44888.7
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		2605.3		52443.3	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.95
Osmotic press.,psi	425.3	425.3	648.9

Project name : NaCl RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2,ppm : 0.0

Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor :1.5

Feed Pressure : 812.6 psi

Concentrate Pressure : 778.9 psi

Pass	Feed Flow Total Vessel gpm	Conc. Flow Total Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	37.5	1.04	778.9	NTR-759SW-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	403.8	877.9	20951.8	45547.3
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	622.4	877.9	32341.8	45616.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1026.3		53293.5	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	425.3	425.3	660.0

Project name : NACL RO SYSTEM SIMURATION

Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2,ppm : 0.0

Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor :1.5

Feed Pressure : 749.7 psi

Concentrate Pressure : 716.3 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.03	716.3	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	474.8	1032.1	20913.6	45464.3
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	731.8	1032.1	32282.9	45533.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1206.6		53196.5	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	425.3	425.3	658.8

Project name : NACL RO SYSTEM PROJECTION

Permeate flow : 29065 GPD

Feedwater temperature : 27.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2,ppm : 0.0

Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor :1.5

Feed Pressure : 766.3 psi

Concentrate Pressure : 732.5 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.04	732.5 NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	395.3	859.3	20956.4	45557.4
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	609.2	859.3	32348.9	45626.1
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1004.5		53305.3	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	0.96
Osmotic press.,psi	416.9	416.9	647.3

Project name : NACL RO SYSTEM PROJECTION Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 40.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor : 1.5

Feed Pressure : 798.6 psi

Concentrate Pressure : 773.3 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	50.5	50.5	30.3	30.3	1.03	773.3	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	509.4	1107.5	22593.7	49116.8
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	785.2	1107.5	34876.5	49191.2
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1294.6		57470.2	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	1.04
Osmotic press.,psi	425.3	425.3	714.9

Project name : NACL RO SYSTEM PROJECTION

Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2,ppm : 0.0

Recovery : 45.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor :1.5

Feed Pressure : 841.0 psi

Concentrate Pressure : 821.1 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	44.9	44.9	24.7	24.7	1.03	821.1	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	543.3	1181.2	24573.6	53420.9
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	837.4	1181.2	37933.6	53502.1
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		1380.8		62506.6	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	1.14
Osmotic press.,psi	425.3	425.3	781.8

Project name : SAUDI ARABIA SEA WATER RO PROJECTIO
 Permeate flow : 29065 GPD
 Feedwater temperature : 33.0 C
 Raw water pH : 8.00
 Acid dosage, ppm(100%): 19.9 H2SO4
 Acidified feed CO2,ppm : 19.9
 Recovery : 35.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor : 1.5

Feed Pressure : 857.3 psi

Concentrate Pressure : 824.1 psi

Pass	Feed Flow Total Vessel gpm	Flow Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	57.7	57.7	37.5	37.5	1.03	824.1	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	3.8	9.4	728.7	1817.3
Mg	1555.0	6399.2	1555.0	6399.2	12.4	51.0	2385.6	9817.4
Na	13284.0	28878.3	13284.0	28878.3	504.4	1096.5	20165.3	4837.7
K	493.0	632.1	493.0	632.1	23.3	29.9	745.9	956.3
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.1	0.2
HCO3	146.4	120.0	122.5	100.4	7.6	6.2	184.4	151.2
SO4	3675.0	3828.1	3694.5	3848.4	32.2	33.5	5666.5	5902.6
Cl	23500.0	33145.3	23500.0	33145.3	813.3	1147.1	35715.9	50375.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.8	
TDS	43129.4		43124.6		1397.0		65593.4	
pH	8.0		7.0		5.8		7.2	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.3	26.4	44.5
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.5
Langelier ind.	1.29	0.21	0.74
Stiff & Davis ind.	0.27	-0.81	-0.30
Ionic strength	0.89	0.89	1.40
Osmotic press.,psi	490.6	490.5	763.6

Project name : SAUDI ARABIA SEAWATER RO PROJECT Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 40.0%
 Raw water pH : 8.00 Element age : 0.0 years
 Acid dosage, ppm(100%): 19.9 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 19.9 3-yr salt passage increase factor : 1.5

Feed Pressure : 918.1 psi

Concentrate Pressure : 893.0 psi

Pass	Feed Flow Total gpm	Feed Flow Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	50.5	50.5	30.3	30.3	1.03	893.0	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	4.1	10.2	788.9	1967.5
Mg	1555.0	6399.2	1555.0	6399.2	13.3	54.9	2582.8	10628.7
Na	13284.0	28878.3	13284.0	28878.3	542.1	1178.5	21778.6	47344.8
K	493.0	632.1	493.0	632.1	25.1	32.1	804.9	1032.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.1	0.2
HCO3	146.4	120.0	122.5	100.4	8.1	6.7	198.8	163.0
SO4	3675.0	3828.1	3694.5	3848.4	34.6	36.1	6134.4	6390.0
Cl	23500.0	33145.3	23500.0	33145.3	874.2	1233.0	38583.9	54420.1
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.8	
TDS	43129.4		43124.6		1501.6		70873.3	
pH	8.0		7.0		5.8		7.2	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.3	26.4	49.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.6
Langelier ind.	1.29	0.21	0.84
Stiff & Davis ind.	0.27	-0.81	-0.21
Ionic strength	0.89	0.89	1.52
Osmotic press.,psi	490.6	490.5	829.6

Project name : SAUDI ARABIA SEAWATER RO PROJECTION Permeate flow : 29065 GPD

Feedwater temperature : 30.0 C Recovery : 45.0%
 Raw water pH : 8.00 Element age : 0.0 years
 Acid dosage, ppm(100%): 19.9 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 19.9 3-yr salt passage increase factor : 1.5

Feed Pressure : 974.4 psi

Concentrate Pressure : 954.5 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Flow Total Vessel gpm gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	44.9 44.9	24.7 24.7	1.03	954.5	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	4.0	9.9	860.4	2145.6
Mg	1555.0	6399.2	1555.0	6399.2	13.0	53.4	2816.7	11591.2
Na	13284.0	28878.3	13284.0	28878.3	526.4	1144.2	23722.1	51569.7
K	493.0	632.1	493.0	632.1	24.3	31.2	876.4	1123.7
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.2	0.3
HCO3	146.4	120.0	122.5	100.4	7.9	6.5	216.3	177.3
SO4	3675.0	3828.1	3694.5	3848.4	33.6	35.0	6689.8	6968.5
Cl	23500.0	33145.3	23500.0	33145.3	848.8	1197.2	42032.8	59284.6
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.9	
TDS	43129.4		43124.6		1458.0		77215.6	
pH	8.0		7.0		5.8		7.3	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.6	26.8	55.1
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.7
Langelier ind.	1.22	0.14	0.88
Stiff & Davis ind.	0.20	-0.88	-0.17
Ionic strength	0.89	0.89	1.66
Osmotic press.,psi	485.8	485.7	901.1

Project name : SAUDI ARABIA SEAWATER RO PROJECT Permeate flow : 29065 GPD

Feedwater temperature : 33.0 C Recovery : 45.0%
 Raw water pH : 8.00 Element age : 0.0 years
 Acid dosage, ppm(100%): 19.9 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 19.9 3-yr salt passage increase factor : 1.5

Feed Pressure : 970.0 psi

Concentrate Pressure : 950.3 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	44.9	44.9	24.7	24.7	1.02	950.3	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	4.4	10.9	860.1	2144.8
Mg	1555.0	6399.2	1555.0	6399.2	14.3	58.7	2815.6	11586.9
Na	13284.0	28878.3	13284.0	28878.3	578.1	1256.8	23679.7	51477.6
K	493.0	632.1	493.0	632.1	26.7	34.3	874.5	1121.1
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.2	0.3
HCO3	146.4	120.0	122.5	100.4	8.7	7.1	215.7	176.8
SO4	3675.0	3828.1	3694.5	3848.4	37.0	38.5	6687.0	6965.7
Cl	23500.0	33145.3	23500.0	33145.3	932.3	1315.0	41964.5	59188.2
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.9	
TDS	43129.4		43124.6		1601.4		77098.2	
pH	8.0		7.0		5.9		7.2	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.3	26.4	54.4
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.6
Langelier ind.	1.29	0.21	0.94
Stiff & Davis ind.	0.27	-0.81	-0.10
Ionic strength	0.89	0.89	1.66
Osmotic press.,psi	490.6	490.5	908.4

Project name : NACL RO SYSTEM PROJECTION

Permeate flow : 16500 GPD

Feedwater temperature : 33.0 C
 Raw water pH : 6.50
 Acid dosage, ppm(100%): 0.0 H2SO4
 Acidified feed CO2, ppm : 0.0

Recovery : 40.0%
 Element age : 0.0 years
 Flux decline coefficient : -0.035
 3-yr salt passage increase factor : 1.5

Feed Pressure : 723.6 psi

Concentrate Pressure : 712.6 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	28.6	28.6	17.2	17.2	1.01	712.6	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	918.8	1997.4	22320.8	48523.5
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	1416.1	1997.4	34455.9	48597.9
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		2334.9		56776.7	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	1.03
Osmotic press.,psi	425.3	425.3	705.8

Project name : NACL RO SYSTE PROJECTION Permeate flow : 16500 GPD
 Feedwater temperature : 33.0 C Recovery : 45.0%
 Raw water pH : 6.50 Element age : 0.0 years
 Acid dosage, ppm(100%): 0.0 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 0.0 3-yr salt passage increase factor :1.5

Feed Pressure : 794.8 psi Concentrate Pressure : 786.5 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	25.5	25.5	14.0	14.0	1.01	786.5	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Na	13760.0	29913.0	13760.0	29913.0	1010.8	2197.5	24191.1	52589.4
K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cl	21240.0	29957.7	21240.0	29957.7	1558.0	2197.5	37343.4	52670.6
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDS	35000.0		35000.0		2568.9		61534.6	
pH	6.5		6.5					

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	0.0	0.0	0.0
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.0	0.0	0.0
Langelier ind.	0.00	0.00	0.00
Stiff & Davis ind.	0.00	0.00	0.00
Ionic strength	0.62	0.62	1.12
Osmotic press.,psi	425.3	425.3	768.8

Project name : SAUDI ARABIA SEAWATER RO PROJECTION Permeate flow : 16500 GPD

Feedwater temperature : 33.0 C Recovery : 35.0%
 Raw water pH : 8.00 Element age : 0.0 years
 Acid dosage, ppm(100%): 19.9 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 19.9 3-yr salt passage increase factor : 1.5

Feed Pressure : 782.1 psi

Concentrate Pressure : 767.7 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Flow Total Vessel gpm gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	32.7 32.7	21.3 21.3	1.01	767.7	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	6.9	17.1	727.1	1813.1
Mg	1555.0	6399.2	1555.0	6399.2	22.5	92.5	2380.2	9795.1
Na	13284.0	28878.3	13284.0	28878.3	910.9	1980.3	19946.4	43361.8
K	493.0	632.1	493.0	632.1	42.1	54.0	735.8	943.3
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.1	0.2
HCO3	146.4	120.0	122.5	100.4	13.7	11.2	181.2	148.5
SO4	3675.0	3828.1	3694.5	3848.4	58.3	60.7	5652.5	5888.0
Cl	23500.0	33145.3	23500.0	33145.3	1469.0	2072.0	35362.8	49877.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.8	
TDS	43129.4		43124.6		2523.4		64986.8	
pH	8.0		7.0		6.1		7.2	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.3	26.4	44.6
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.5
Langelier ind.	1.29	0.21	0.72
Stiff & Davis ind.	0.27	-0.81	-0.32
Ionic strength	0.89	0.89	1.38
Osmotic press.,psi	490.6	490.5	755.7

Project name : SAUDI ARABIA SEAWATER RO PROJECTION Permeate flow : 16500 GPD

Feedwater temperature : 33.0 C Recovery : 40.0%
 Raw water pH : 8.00 Element age : 0.0 years
 Acid dosage, ppm(100%): 19.9 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 19.9 3-yr salt passage increase factor :1.5

Feed Pressure : 843.1 psi

Concentrate Pressure : 832.3 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	28.6 28.6	17.2	17.2	1.01	832.3	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	7.4	18.5	786.7	1961.9
Mg	1555.0	6399.2	1555.0	6399.2	24.3	100.1	2575.5	10598.6
Na	13284.0	28878.3	13284.0	28878.3	983.4	2137.9	21484.4	46705.2
K	493.0	632.1	493.0	632.1	45.4	58.2	791.4	1014.6
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.1	0.2
HCO3	146.4	120.0	122.5	100.4	14.7	12.1	194.4	159.4
SO4	3675.0	3828.1	3694.5	3848.4	63.0	65.7	6115.5	6370.3
Cl	23500.0	33145.3	23500.0	33145.3	1586.0	2237.0	38109.3	35375.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.8	
TDS	43129.4		43124.6		2724.4		70058.1	
pH	8.0		7.0		6.1		7.2	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.3	26.4	49.1
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.6
Langelier ind.	1.29	0.21	0.82
Stiff & Davis ind.	0.27	-0.81	-0.23
Ionic strength	0.89	0.89	1.50
Osmotic press.,psi	490.6	490.5	818.9

Project name : SAUDI ARABIA SEAWATER RO PROJECTION Permeate flow : 16500 GPD
 Feedwater temperature : 33.0 C Recovery : 45.0%
 Raw water pH : 8.00 Element age : 0.0 years
 Acid dosage, ppm(100%): 19.9 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2, ppm : 19.9 3-yr salt passage increase factor : 1.5

Feed Pressure : 913.3 psi

Concentrate Pressure : 905.0 psi

Pass	Feed Flow Total Vessel gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	25.5	25.5	14.0	14.0	1.01	905.0	NTR-759HR-SW8S	6 1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	8.1	20.1	857.0	2137.2
Mg	1555.0	6399.2	1555.0	6399.2	26.4	108.8	2805.6	11545.8
Na	13284.0	28878.3	13284.0	28878.3	1066.3	2318.1	23280.3	50609.3
K	493.0	632.1	493.0	632.1	49.2	63.1	856.1	1097.6
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.2	0.3
HCO3	146.4	120.0	122.5	100.4	15.9	13.0	209.8	172.0
SO4	3675.0	3828.1	3694.5	3848.4	68.5	71.4	6661.2	6938.8
Cl	23500.0	33145.3	23500.0	33145.3	1719.8	2425.7	41320.1	58279.5
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.9	
TDS	43129.4		43124.6		2954.3		75991.3	
pH	8.0		7.0		6.1		7.2	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.3	26.4	54.5
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.6
Langelier ind.	1.29	0.21	0.92
Stiff & Davis ind.	0.27	-0.81	-0.13
Ionic strength	0.89	0.89	1.64
Osmotic press.,psi	490.6	490.5	893.7

Project name : SAUDI ARABIA SEAWATER RO PROJECT. Permeate flow : 22800 GPD

Feedwater temperature : 33.0 C Recovery : 45.0%
 Raw water pH : 8.00 Element age : 0.0 years
 Acid dosage, ppm(100%): 19.9 H2SO4 Flux decline coefficient : -0.035
 Acidified feed CO2,ppm : 19.9 3-yr salt passage increase factor : 1.5

Feed Pressure : 932.7 psi Concentrate Pressure : 919.1 psi

Pass	Feed Flow Total Vessel gpm gpm	Conc. Total gpm	Flow Vessel gpm	Beta	Conc. Press. psi	Element Type	Element No.	Array
1	35.2 35.2	19.4	19.4	1.02	919.1	NTR-759HR-SW8S	6	1x6

Ion	Raw water		Feed water		Permeate		Concentrate	
	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*	mg/l	ppm*
Ca	475.0	1184.5	475.0	1184.5	5.6	14.1	859.0	2142.2
Mg	1555.0	6399.2	1555.0	6399.2	18.5	76.0	2812.2	11572.7
Na	13284.0	28878.3	13284.0	28878.3	748.0	1626.1	23540.7	51175.5
K	493.0	632.1	493.0	632.1	34.6	44.3	868.1	1112.9
NH4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	0.5	0.8	0.1	0.1	0.0	0.0	0.2	0.3
HCO3	146.4	120.0	122.5	100.4	11.2	9.2	213.6	175.1
SO4	3675.0	3828.1	3694.5	3848.4	47.9	49.9	6678.1	6956.3
Cl	23500.0	33145.3	23500.0	33145.3	1206.3	1701.4	41740.3	58872.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SiO2	0.5		0.5		0.0		0.9	
TDS	43129.4		43124.6		2072.1		76713.1	
pH	8.0		7.0		6.0		7.2	

Notes: *ppm as CaCO3. Calculated concentrations are accurate to +/- 10%

	Raw water	Feed water	Concentrate
CaSO4/Ksp*100,%	26.3	26.4	54.4
SrSO4/Ksp*100,%	0.0	0.0	0.0
BaSO4/Ksp*100,%	0.0	0.0	0.0
SiO2 sat.,%	0.4	0.4	0.6
Langelier ind.	1.29	0.21	0.93
Stiff & Davis ind.	0.27	-0.81	-0.11
Ionic strength	0.89	0.89	1.65
Osmotic press.,psi	490.6	490.5	903.3

RECORDING SHEET FOR R-6 EXPERIMENT (71-2-1)

DATE
Nov. 24, 1991

TIME	PRESS	F E E D			COOLING SYS.		FEED TANK		CELL No	MEMBRANE NAME
		TEMP. °C	EC	pH	TEMP. (°C)	IN	OUT	IN		
10:00	Start	25.0	45.6				25.0		1 5 3	SC-8000
10:30	5.6	(24.8)	46.0		14.0	16.9	24.8	24.8		
10:30		26.0	46.0		16.0	19.7	26.1	25.9		
11:40		25.0	46.0		18.5	-	22.5	27.0		
11:53	5.6	28.5	46.0	9.33	20.5		22.8	28.3		

↓
 NaCl
 20.000 ml/l

Cell No	TIME	PRESS	BRINE FLUX	time	P E M E A T E			CALCULATED		
					Flux	EC	pH	Conc.	Rej	Flux
	:	MPa	l/min	min	ml/scale	μS/cm	-	mg/l	%	m ³ /m ² ·day
1	10:30	5.6	2.0	0	1.8		7.5			
	11:00	2.750 psi	1.9	30	20.6/8.4	1729/1638	22.5	888	97.04	0.707
	11:30				21.9/9.1	1750/1638	8.2	899		0.751
	12:05	850	1.9		21.0/8.6	1690/1610	7.1	867		0.720
								AV 885	AV 97.05	AV 0.726
2	10:30	2.750 psi	2.0	0	1		7.5			
	11:00		2.0	30	19.4/8.6	1640/1560	22.7	840		0.656
	11:30				20.6/8.4	1640/1540	8.2	840		0.707
	12:05	795	2.0		19.9/8.0	1630/1530	7.2	846		0.681
								AV 842	AV 97.19	AV 0.681
3	10:30	805	2.0	0	1		7.5			
	11:00		2.0	30	19.5/8.8	1624/1536	22.5	830		0.669
	11:30				20.4/8.3	1630/1530	7.9	835		0.700
	12:00	805	2.0		20.1/8.1	1630/1530	7.2	851		0.688
								AV 839	AV 97.20	AV 0.686

Product NaCl = $\left(\frac{EC}{2.4998}\right) 1.0943 (= \text{NaCl}_p)$

PRD: 91.11.22

Flux_(p) = 1.86 x scale + 5 (ml) ; Flux_(calc) = Flux_(p) × 3.427 × 10⁻² (m³/m²·day)

Rej = $\left(1 - \frac{Flux_{(p)}}{Flux_{(calc)}}\right) \times 100$ 7-84

RECORDING SHEET FOR R-6 EXPERIMENT (11-2-2) DATE Nov. 24, 1991

TIME	PRESS	FEED			COOLING SYS.		FEED TANK		CELL	MEMBRANE
		TEMP	EC	PH	TEMP.(°C)		TEMP.(°C)			
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT	No	NAME
:									4	SC-8000
:									5	
:									6	

Cell No	TIME	PRESS	BRINE FLUX	time	PE MEAT E			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
:	:	MPa	l/min	min	ml/scale	μS/cm	-	mg/l	%	m ³ /m ² ·day
4	10:30	800ps	2.0	0	/		7.6			
	11:00		2.0	30	20.3/8.2	2170 2030	22.2	1120		0.69
	11:30				21.0/8.6	2120 1990	7.7	1096		0.72
	12:00	800	2.0		20.6/8.4	2020 1920	7.2	1075		0.71
	:				/			AV	AV	AV
					/			1098	96.34	0.71
5	10:30	800	2.0	0	/		7.6			
	11:00		2.0	30	19.3/7.7	1665 1564	22.3	854		0.66
	11:30				20.8/8.5	1640 1590	7.6	840		0.71
	12:00	800	1.9		19.7/7.9	1630 1540	7.2	835		0.67
	:				/			AV	AV	AV
					/			843	97.19	0.68
6	10:30	800	2.0	0	/		7.6			
	11:00		2.0	30	21.4/8.8	3350 3150		1759		0.73
	11:30				22.7/9.5	3420 3210	8.5	1797		0.78
	12:00	800	2.0		21.9/9.1	3400 3210	7.8	1786		0.75
	:				/			AV		
					/			1781	94.06	0.75

PRO: 91.11.22 mba

RECORDING SHEET FOR R-6 EXPERIMENT (T1-2-3)

DATE
Nov. 24, 1991

TIME	PRESS	FEED			COOLING SYS.		FEED TANK		CELL	MEMBRANE
		TEMP.	EC	PH	TEMP. (°C)	TEMP. (°C)	IN	OUT		
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT	No	NAME
10:30	800								No	SC-8000
:									7	
:									5	
:									8	
:										
:										
:										

Cell No	TIME	PRESS	BRINE FLUX	time	PEMEATE			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
	:	MPa	l/min	min	ml/scale	MS/cm	-	mg/l	%	m ³ /m ² .day
7	10:30	800	2.0	0	/		7.6			
	11:00		2.0	30	20.5/	1670/1540	6.	835	97.2	0.70
	:30				21.5/	1640/1540/1520	6.8	840		0.74
	12:00	800	1.9		20.5/	1660/1570/225	7.0	851		0.70
	:					/			AV 842	AV 97.19
8	10:30	800	2.0	0	/		7.6			
	11:00		2.0	30	20.4/	3120/2990		1634	95.8	0.70
	:30				20.5/	2060/214	6.7	1064		0.70
	12:00	800	2.0		19.5/	2070/1940/22	6.9	1069		0.67
	:					/			AV 1256	AV 95.81
9	11:30	800	2.0	0	/		7.6			
	11:00		1.9	30	19.5/	1990/1890		1027	94.85	0.67
	:30				21.5/	3370/3150/218	6.8	1770		0.74
	12:00	800	1.9		20.5/	3490/3287/224	-	1835		0.70
	:					/			AV 1544	AV 94.85

PRO: 91.11.22 mls

RECORDING SHEET FOR R-6 EXPERIMENT (1-2-4) DATE Nov. 28, 1991

TIME	PRESS	FEED			COOLING SYS.		FEED TANK		CELL	MEMBRANE
		TEMP.	EC	PH	TEMP. (°C)		TEMP. (°C)			
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT	No	NAME
:										
:										
:										
:										
:										
:										
:										
:										
:										
:										

Cell No	TIME	PRESS	BRINE FLUX	time	PERMEATE			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
					ml / scale	µ S/cm	-	mg/l	%	m ³ /m ² .day
10	10:30	800	2.0	0	/		7.6			
	11:00		2.0	30	21.8 /	(3710) / 3510		1955		0.75
	:30				18.0 /	(3670) / 3400 / 21.8	7.3	1933		0.62
	12:00	810	2.0		21.2 /	(3590) / 3410 / 22.4	7.6	1890		0.73
	:				/			AV	AV	AV
					/			1926	93.58	0.70
11	10:30	790	2.0	0	/		7.6			
	11:00		1.9	30	19.3 /	(1620) / 1530		830		0.66
	:30				20.5 /	(1660) / 1570 / 21.4	7.5	857		0.70
	12:00	790	1.9		19.1 /	(1650) / 1570 / 22.4	7.8	846		0.67
	:				/			AV	AV	AV
					/			842	97.19	0.68
12	10:30	800	2.0	0	/		7.6			
	11:00		2.0	30	15.8 /	(1820) / 1720		936		0.54
	:30				22.0 /	(1910) / 1790 / 21.4	7.4	984		0.75
	12:00	800	1.9		20.7 /	(1890) / 1780 / 22.4	7.6	973		0.70
	:				/			AV	AV	AV
					/			964	96.78	0.66

PRO: 91.11.22 mba

RECORDING SHEET FOR R-6 EXPERIMENT (PI-1-1) DATE 27. Nov. 1991

TIME	PRESS	FEED			COOLING SYS.		FEED TANK		CELL No	MEMBRANE NAME
		TEMP	EC	PH	TEMP.(°C)	TEMP.(°C)	IN	OUT		
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT		
10:20	start								1	UTC-80HR
:30	(800PSI)	25°C	(46.2, 25°C) 46.3		14.0	18.0	25.0	25.2		(Today)
11:00	800	29.	(46.2, 25°C) 49.0	6.6	20.0	-	28.0	27.5	2	UTC 80 HF
11:50	800	25.5	(47.2, 25°C) 47.5	6.5	15.0	-	25.2	25.4		(")
13:05	800	25.8	(47.6, 25.4) 47.4	6.6	16.0	18.8	25.4	25.4	3	UTC 90
13:45		27.			20.	21.5	26.6	26.6		(")

Cell No	TIME	PRESS	BRINE FLUX	time	PERMEATE			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
	:	MPa	l/min	min	ml/scale	µS/cm	-	mg/l	%	mm³/m²·day
1	:30		1.6	18'00"	21.2/8.7	(23.0) 2,660				
	:45			1:32'51"	/	3,230		2020	93.3	1.21
	:50			1:53'50"	20.3/8.2	(23.0) 2400				
	:55			30'	30 /	2500		1300		0.99
	13:45	800	1.6	30'	30 /	(23.9) 2220		1182		1.03
2	:30		1.6	18'00"	23.0/9.7	(23.3) 970				
	:45			1:10'20"	/	1,019		508	98.31	1.32
	:50			30'45"	25.6/11.1	(23.0) 921		484		1.32
	:55			30'	38 /	062		470		1.30
	13:45	800PSI	1.6	30'	38 /	(23.9) 910		465		1.30
3	:43		1.5	4'05"	25.1/10.8	(22.9) 3720	189ml			
	:50			8'05"	25.6/11.1	4600	192ml	21400		6.45
	:55			27'11"	24.5/10.5	22.7 3440	212ml			6.58
	:58			(208sec)	22 /	36200		22500		7.27
	13:45	800	1.6	30'	224 /	(23.9) 357		22900		7.57
								22200		7.68
								AV 22250	AV 25.83	AV 7.11

$$NaCl = \left(\frac{EC}{2.4392} \right)^{1.0543} \quad (EC < 18,000), \quad NaCl = \left(\frac{EC+517}{16.64} \right)^{1.282} \quad (EC > 17,000)$$

$$Flux_{(p)} = 1.26 \times scale + 5 \text{ (ml)} \quad Flux_{(m^3/m^2 \cdot day)} = Flux_{(p)} \times 1.427 \times 10^{-2}$$

$$Rej = \left(1 - \frac{NaCl_{(p)}}{1.257} \right) \times 100 \quad 7-88$$

RECORDING SHEET FOR R-6 EXPERIMENT (P1-1-2) DATE 27 Nov 1991

TIME	PRESS	F E E D			COOLING SYS. TEMP.(°C)		FEED TANK TEMP.(°C)		CELL No	MEMBRANE NAME
		TEMP	EC	PH	IN	OUT	IN	OUT		
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT		
:									4	SC-8000 (Toray)
:									5	SC-8000 (")
:									6	NTR-759HR (NITTO)

Cell No	TIME	PRESS MPa	BRINE FLUX l/min	time min	P E M E A T E			CALCULATED			
					Flux ml/scale	EC μ S/cm	PH -	Conc. mg/l	Rej %	Flux $m^3/m^2 \cdot day$	
4	:	800	1.6	30'09	193/7.7	(23.6) 2050					
	:			1:10'40"	25.1/10.8	2120			1.096		0.66
	:			1:51'27"		(22.7) 2210			1.203		0.28
	:			30'	191	2320			1.198		0.65
	:			30'	191	2240			1.182		0.65
	13:45							AV 1.170	AV 96.10	0.71	
5	:	800	1.6	30'07	16.6/7.3	(23.6) 1680					
	:			1:10'40"	24.1/10.3	1740			893		0.64
	:			1:51'27"		(22.9) 1660			893		0.61
	:			30'	181	1740			856		0.62
	:			30'	181	1670			850		0.62
	13:45							AV 873	AV 97.01	0.62	
6	:	800	1.6	18'00	23.4/9.9	(23.1) 1390					
	:			1:31'15"	24.5/10.5	1450			740		1.34
	:			20'6"		(23.0) 1170			619		1.22
	:			30'	431	1220			614		1.47
	:			30'	431	1180			582		1.47
	13:45							AV 639	AV 97.87	1.38	

PRO: 91.11.22

RECORDING SHEET FOR R-6 EXPERIMENT (PI-1-3) DATE 27 Nov. 1991

TIME	PRESS	FEED			COOLING SYS.		FEED TANK		CELL No	MEMBRANE NAME
		TEMP. °C	EC	PH	TEMP. (°C)	IN	OUT	IN		
:	MPa	°C	ms/cm	-	IN	OUT	IN	OUT		
:									7	NTR-759HR (NITTO)
:									8	UTC-80HR (TOYO)
:									9	UTC-80HR ()

Cell No	TIME	PRESS	BRINE FLUX	time	PEMEATE			CALCULATED																
					Flux	EC	PH	Conc.	Rej	Flux														
	:	MPa	l/min	min	ml/scale	µS/cm	-	mg/l	%	mm ³ /m ² .day														
7	:		1.6	15:22	25.0/	(27.0) 1180		624		1.61														
	:			15:55							(23.3) 924	481	1.52											
	:			17:27 (17:27) (2)							142.5/	(24.0) 925	473	1.54										
	:			20:00							90/	940	448	1.54										
	:			30'							45/	892	AV	AV	AV									
	:			13:45							30'	45/	507	98.31	1.55									
8	:		1.6	22:20	23.0/	(27.2) 1,050		550		1.06														
	:			14							(29.7) 1240	661	1.06											
	:			1:10:40										(24.0) 1200	628	1.06								
	:			1:23:54													1238	640	1.03					
	:			(27:27)																30'	30/	620	97.93	1.05
	:			30'																				
9	:		1.6	15:58	21.5/	(27.2) 2490		1397		1.19														
	:			(MEMBRANE CHANGE)							22.8) 3190	1759	0.99											
	:			1:34:09										(23.9) 2790	1494	0.92								
	:			30'													29/	2860						
	:			30'													27/	2780	AV	AV	AV			
	:			13:45													30'	27/	1451	95.09	0.96			
:				1473																				

PRO: 91.11.22

RECORDING SHEET FOR R-6 EXPERIMENT (PI-1-4) DATE 27 Nov. 1991

TIME	PRESS	FEED			COOLING SYS. TEMP. (°C)		FEED TANK TEMP. (°C)		CELL No	MEMBRANE NAME
		TEMP.	EC	pH	IN	OUT	IN	OUT		
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT	No	NAME
:									10	DTC-90
:									11	NTR 759 SW
:									12	NTR 759 SW

Cell No	TIME	PRESS MPa	BRINE FLUX L/min	time min	PE MEAT E			CALCULATED		
					Flux ml/scale	EC μ S/cm	pH	Conc. mg/L	Rej %	Flux $m^3/m^2 \cdot day$
10	10:47		1.6	11'23"	35.4/	(27.1) 2080		12.500		3.20
	10:57		1.6	1:10'40"	33.5/	(22.8) 20200		13.300		3.51
	:			30'	102/	22200		14.000		3.50
	13:45			30'	100/	(23.8) 22800		13.800		3.43
	:				/	23400				
	:				/	23100		AV 13.400	AV 55.33	AV 3.41
11	:		1.6	(22.38) 22'35"	22.6/	(23.6) 1727		919		1.03
	:		1.6	1:10'40" 1:35'11"	24.0/	(29.9) 1788		743		1.01
	:			(24.57) 30'	291/	(23.0) 1394		1069		0.99
	13:45			30'	291/	(24.2) 2030		661	97.80	0.99
	:				/	2070				
	:				/	1300		AV 848	AV 97.17	AV 1.01
12	:		4.6	(21.92) 21'55"	22.0/	(23.2) 1505		799		1.03
	:		1:10'40"	1:35'24"	24.5/	1562		680		1.02
	:			(24.73) 30'	301/	(23.0) 1282		650		1.03
	:			30'	291/	1336		616		0.99
	:				/	(24.7) 1250				
	:				/	1280		AV 686	AV 97.71	AV 1.02
	:				/	1215				0.94

PRO; 91.11.22 mba

RECORDING SHEET FOR R-6 EXPERIMENT (P2-1-1) DATE 1. Dec. 199

(SW)
0

TIME	PRESS	F E E D			COOLING SYS. TEMP. (°C)		FEED TANK TEMP. (°C)		CELL No	MEMBRANE NAME
		TEMP. °C	EC	pH	IN	OUT	IN	OUT		
10:45	Start 800PSI	25.0	42.0	7.0 6.4	9.0	20.8	24.5	24.5	1	UTC-80HR
11:45	800PSI	25.5	47.0	6.4	15.5	19.8	25.3	25.5	2	UTC-80HF
12:15	800PSI	26.0	47.1	6.5	15.5	19.0	26.6	26.2	3	UTC-70
12:50	800PSI	26.5	47.2	6.5	15.0	19.0	26.0	26.6	4	SC-8000
13:20	800	26.0	47.4	6.55	16.5	20.0	25.7	25.8	6	NTR-7591HR
13:50	800	27.0	47.2	6.57	16.0	20.2	26.1	27.0		

Cell No	TIME	PRESS	BRINE FLUX	time	P E M E A T E			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
1	11:45	800PSI	1.6	30	29/	1.055				
2	12:15	↓	1.6	↓	52/	1.216				
3	:	↓	1.6	↓	72/	7.700				
4	:	↓	1.6	↓	20/	1.473				
6	:	↓	1.6	↓	42/	1.151				
	:				1					
1	12:15	800	1.6	35	36/	1.008				
2	:	↓	1.6	↓	64/	1.236				
3	:	↓	1.6	↓	84/	7.540				
4	:	↓	1.6	↓	23/	1.530				
6	:	↓	1.6	↓	50/	1.136				
	:				1					
1	12:50	800	1.6	30	31/	987				
2	:	↓	1.6	↓	54/	1.280				
3	:	↓	1.6	↓	73/	7410				
4	:	↓	1.6	↓	18/	1.540				
6	:	↓	1.6	↓	43/	1.080				
	:				1					

PRD; 91.11.22 mls

RECORDING SHEET FOR R-6 EXPERIMENT (P2-1-2) DATE 1 Dec 199

TIME	PRESS	FEED			COOLING SYS.		FEED TANK		CELL	MEMBRANE
		TEMP	EC	PH	TEMP.(°C)		TEMP.(°C)			
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT	No	NAME
10:45	Start 800PSI		(Ref: P2-1-1)						7	NTR759SW
:									8	UTC-80HR SP
:									9	UTC-80HF SP
:									10	UTC-70 SP
:									11	NTR759 SW SP
:									12	NTR759HR SP

Cell No	TIME	PRESS	BRINE FLUX	time	PE MEAT E			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
					ml / scale	µS/cm	-	mg/l	%	m ³ /m ² .day
7	11:45	800PSI	1.6	30	31/	1539				
8	:	↓	1.6	↓	28/	947				
9	:	↓	1.6	↓	38/	877				
10	:	↓	1.6	↓	71/	6950				
11	:	↓	1.6	↓	28.5/	1937				
12	:	↓	1.6	↓	39.5/	1175				
7	12:15	800	1.6	35	37/	1466				
8	:	↓	1.6	↓	33/	884				
9	:	↓	1.6	↓	46/	835				
12	:	↓	1.6	↓	82.5/	6640				
11	:	↓	1.6	↓	33/	1840				
12	:	↓	1.6	↓	46/	1140				
7	12:50	800	1.6	30	32/	1380	6.21			
8	:	↓	1.6	↓	28/	851	6.5			
9	:	↓	1.6	↓	38/	818				
10	:	↓	1.6	↓	70/	6570				
11	:	↓	1.6	↓	28/	1780				
12	:	↓	1.6	↓	39/	1101				

• spreaded Silicom LUBRICANT without No7.

• SP: Added Spacer

PRD; 91.11.22

RECORDING SHEET FOR R-6 EXPERIMENT (P2-1-3) DATE 1 Dec 199

TIME	PRESS	FEED			COOLING SYS.		FEED TANK		CELL No	MEMBRANE NAME
		TEMP	EC	PH	TEMP (°C)	TEMP (°C)	IN	OUT		
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT		
:	(Ref; P2-1-1)								1	UTC-80HR
:									2	" HF
:									3	UTC-70
:									4	SC-8000
:									5	-
:									6	NTR-7591HR
:									7	" SW
:									8	UTC-80HR
:									9	" HF
:									10	UTC-70
:									11	NTR-759SW
:									12	" HR

Cell No	TIME	PRESS	BRINE FLUX	time	PE MEAT E			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
	:	MPa	l/min	min	ml/scale	µS/cm	-	mg/l	%	cm ³ /m ² ·day
1	13:20 13:50	800PSI	1.6	30	30/	965	6.1			
2	:	↓	↓	↓	55/	1277	6.49			
3	:	↓	↓	↓	77/	7320	6.18			
4	:	↓	↓	↓	20/	1480	6.52			
6	:	↓	↓	↓	43/	1050	6.20			
	:				/					
7	13:20 13:50	800PSI	1.6	1.6	32/	1,320	6.23			
8	:	↓	↓	↓	28/	833	6.46			
9	:	↓	↓	↓	38/	784	6.05			
10	:	↓	↓	↓	70/	8250	6.30			
11	:	↓	↓	↓	28/	1698	6.24			
12	:	↓	↓	↓	39/	1054	6.34			
	:				/					
	:				/					
	:				/					
	:				/					
	:				/					
	:				/					

PRD: 91.11.22 - mba

RECORDING SHEET FOR R-6 EXPERIMENT (P3-1-1) DATE 3 Dec 1991

TIME	PRESS	F E E D			COOLING SYS.		FEED TANK		CELL	MEMBRANE
		TEMP	EC	PH	TEMP.(°C)		TEMP.(°C)			
:	MPa	°C	MS/cm	-	IN	OUT	IN	OUT	No	NAME
9:50	800 PSI	24.0	53.1	6.56	14.0	18.0	23.8	23.6	1	DTC-20HR
10:20	800 PSI	25.5	53.0	6.58	15.0	19.5	25.4	25.4	2	DTC 20HT
10:50		26.0	53.1	6.59	16.0	19.5	25.0	25.2	3	DTC 70
11:20	800	26.5	53.1	6.61	16.5	19.8	26.0	26.3	4	
11:50	800	27.0	53.1	6.62	19.0	21.7	26.7	26.5	5	
12:20		29.5	53.1	6.63	22.0	24.5	29.0	28.1	6	
12:50		30.5			24.0					
13:05		33.5	53.1	6.63	28.5		33.0	31.2		

Cell No	TIME	PRESS	BRINE FLUX	time	P E M E A T E			CALCULATED		
					Flux	EC	PH	Conc.	Rej	Flux
					ml/scale	µS/cm	-	mg/l	%	m³/m²·day
1	10:20	800	1.6	30	25/	1016				
	10:50				26.5/	929				
	11:20				27.0/	999				
	:				/					
	:				/					
2	10:20	800	1.6	30	51/	19680				
	10:50				51.5/	20200				
	11:20				53.1/	19930				
	:				/					
	:				/					
3	10:20	800	1.6	30	63/	11990				
	10:50				63/	11780				
	11:20				65/	11700				
	:				/					
	:				/					

PRO: 91.11.22 mka