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Study on Scale Formation and Suppression
in Heat-Exchange Systems
for Simulated Geothermal Brines

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for period
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J. S. Wilson
J. E. King
G. R. Bullard

The Dow Chemical Company
Texas Division
Freeport, Texas 77541

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SUMMARY

Control of scale formation in heat exchangers using simulated geothermal waters can be achieved by lowering the pH of the water to pH 6 or lower. This does not, however, appear to be an economic approach for highly buffered geothermal brines and would lead to severe corrosion problems.

Two commercial scale control agents, Calgon CL-165 and Monsanto Dequest 2060, showed promise of effecting scaling in a minor way and should be tested further on actual geothermal waters.

Other scale control methods tested were unsuccessful. These included seeding experiments, turbulence promotion and electrostatic and electromagnetic devices reputed to modify scale formation.

The experiments were performed with tube-in-shell heat exchangers using simulated geothermal waters prepared from a salt dome solution based brine. The scale formed was primarily silica with a small percent of calcium carbonate and traces of magnesium and iron. Physically it was a hydrous soft solid adhering only lightly to the heat exchange surface. This is not typical of geothermal water scales encountered in high temperature brine operations and the results of the scale control experiments should be evaluated with that in mind.

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STUDY ON SCALE FORMATION AND SUPPRESSION
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U.S.D.O.E.
EY-76-C-02-2833.*000

Final Report
For Period January 12, 1976 - March 5, 1978

I. Introduction

A. The Geothermal Scale Problems and Approaches

Many proposed applications for geothermal heat usage require heat exchange between the geothermal fluid and low boiling liquids or less corrosive water. One of the problems inherent in such processes is the scaling which may occur on the hot geothermal fluid side of the heat exchange surface.¹ This results in decreased heat exchange coefficients requiring increased surface, hence increased capital cost. In severe cases, plugging of the heat exchanger may even occur.

This project was undertaken to investigate possible means of preventing or alleviating such scale formation. Several approaches were taken. These include:

- Addition of commercial scale prevention agents
- Carbon dioxide overpressure to prevent calcium carbonate precipitation
- Pre-seeding with nuclei such as calcium sulfate to form suspended solids which may carry through the heat exchangers
- Investigation of the effectiveness of electrical and magnetic "black box" scale prevention devices

All four of these areas of investigation were pursued.

The magnitude of the scaling problems of geothermal brines will be dependent on the composition of the brines. This composition will, in turn, be controlled by the temperature and geological formation present in the reservoir.² In formations where conditions have resulted in high salinity, high temperature brines the strong complexing action of the chloride ion solubilizes the active rocks leading to fluid with high levels of heavy metals, hydrogen sulfide, silicates and carbonates. Lower temperature,

less saline resources give less complex brines. However, all may be expected to be saturated with silica and to contain high levels of bicarbonate ions with greater or lesser amounts of the alkaline earth ions, calcium and magnesium.

B. The Nature of the Scale and the Brine

For the purpose of this study only the most common types of scale were chosen for consideration, namely silica and calcium carbonate. This decision was based upon the belief that silica would represent the major scaling problems in view of its temperature dependent solubility range and that calcium carbonate would be not only the second most serious scale component but could also be the principal seeding agent for the formation of silica scale.

This is a simplified approach to the total problem of geothermal scaling which is recognized to involve metal sulfides, metal silicates and many other compounds. However, it is believed that control of scale in a silica-carbonate system would alleviate the major problem in heat exchange scaling in geothermal heat recovery.

The solubility of silica in saline water is a function of, not only the temperature of the water, but also the form of silica solids in equilibrium with the solution. A summary of the solubility relationships is given by Barnes.³ For the purpose of this study it was assumed that typical geothermal brines will be equilibrium with quartz, will have a pH near neutral and high levels of carbon dioxide in the form of bicarbonate and dissolved gas. The levels chosen for the temperature of 350°F (177°C) was 400 ppm silica as SiO_2 and 800 ppm total carbonate as CO_2 . These values were used in all scaling runs except those designed to study the effects of silica levels. Table 1 lists the composition chosen for a standard simulated geothermal brine.

II. Technical Approach

A. Scale Prevention Methods

The four approaches to achieving the purpose of this project, investigation of methods for controlling scale formation in geothermal brine heat exchange systems, has been stated in Section I.

The principal methods chosen for scale modification was the use of scale control additives in small amounts. This approach has proven successful in heat exchanger, cooling tower and many other water systems applications. Such additives are items of commerce selling for a typical price of \$1.00/lb and intended for low level addition.

If the heat exchange system is used in the generation of electrical power by the secondary fluid cycle, the additive cost per unit of power is a possible approach to determining economic levels of an additive. Assuming 375°F (190°C) geothermal water and 300 gpm or 2500 lbs/min water flow per Mwe⁴, the additive at 10 ppm would add approximately 1.5 mils/Kwh to the cost of the power. On this basis, addition up to 30 ppm would be reasonable adding only 4.5 mils to the cost per Kwh.

The selection of additives for testing was confined to those already available on the market except for one experimental silicate which was hoped to be effective in reducing silica scaling. This was tried because all the commercial additives found were calcium carbonate (CaCO₃) scale control agents which would work on silica only if seeding by calcium carbonate was the primary scale forming mechanism.

These additives are generally surface active agents and act by attaching to the small seed particles as they form, thus preventing crystal growth and particle coalescence to larger scale forming solids.

Pursuing the idea of silica scale seeding by calcium carbonate particles, a second method intended to prevent carbonate precipitation was tried. This method was the maintenance of a carbon dioxide (CO₂) over-pressure in the heat exchanger to prevent loss of CO₂ with the resulting conversion of bicarbonate ion to carbonate ion precipitating calcium carbonate as calcite.

The relations of calcium ion concentration to CO₂ overpressure is expressed by Holland² as

$$M_{Ca^{++}} = \frac{K_1 K_{cal} B f_{CO_2}}{4K_2 \gamma^3 \pm Ca (HCO_3)_2}$$

where:

K_1 = first ionization constant of carbonic acid

K_2 = second ionization constant of carbonic acid

K_{cal} = Solubility product of calcite

B = Inverse Henry's Law constant for CO_2 in water; moles CO_2 /liter of solution per atmosphere pressure

f_{CO_2} = fugacity of CO_2

$\gamma_{Ca(HCO_3)_2}^+$ = means activity coefficient of $Ca(HCO_3)_2$ in solution

From the above equilibrium system it follows, as stated by Shannon¹, that

- "Calcite can not deposit by simply cooling the solution.
- At any given temperature calcite can be deposited by CO_2 release.
- Calcite can deposit if the solution boils and releases CO_2 . Boiling can, and usually does, occur when water depressurizes as it comes up a geothermal bore.
- Calcite deposition is more likely to occur in production from lower temperature reservoirs with high CO_2 gas content than where $CaCO_3$ is more soluble. For example: complete release of 70 atm CO_2 pressure from a 150°C solution would deposit 450 mg $CaCO_3$ /kg solution, whereas the same release from a 300°C solution is only 60mg/kg (Holland, 1967)."

Indications are that most calcite scale depositions occur when CO_2 is lost from the waters due either to pressure release or boiling. Simple cooling in a pressurized heat exchanger should not cause deposition due to the increase temperature solubility of calcite. To avoid pressure drop on cooling, the heat exchanger must be pressurized with at least the same partial pressure of CO_2 existing in the original waters. Thus a heat exchanger with an overpressure of CO_2 should prevent precipitation. If calcite should be serving as a seeding mechanism for silica scale formation, CO_2 overpressure should also decrease the silica

scaling. An experiment was designed to test this concept using a vertical heat exchanger with the geothermal waters on the shell side and with the capability of CO₂ pressurization above the geothermal water level.

A second seeding concept investigated was the formation of many solid seeding particles in the brine just prior to entering the heat exchanger with the idea that silica, which tends to supersaturate, might deposit on these particles and be carried through the heat exchanger without scaling. The solid chosen was calcium sulfate (CaSO₄). Because of its inverse solubility with temperature, solid CaSO₄ formed at high temperature will tend to dissolve in the cooler brine discharge from the exchanger and thus not present a solids problem in the waste brine.

Another approach to scale prevention is the use of electrostatic or magnetic devices claimed to either prevent scale formation or to alter the scale formed to a soft easily removed type. Very little published information is available on such devices, often referred to as "Black Boxes". One paper, by B. Q. Welder and E. P. Partridge⁵ compiled the case histories of such devices and reported the results at the Fourteenth Water Conference. They concluded that such devices had proven useless.

Introduction of such gadgets with many claims and testimonials seem to follow twenty year cycles and we are currently enjoying an up cycle. Therefore, it seemed appropriate to test the "Black Box" technique for scale prevention.

Two products were chosen. One from Progressive Equipment Corporation of Erie, Pennsylvania, the Progressive Electronic Water Treater, is claimed to be a high DC voltage capacitor using fluorocarbon coated electrodes with the positive electrode in the center of the flow. It reportedly attracts free electrodes and builds up a high level of excitement in the brine lasting for hours and producing either no scale or a very soft scale form. The other was an electromagnetic device called "Electro-MagTM" from Electronic Water Conditioners, Inc. of Miami, Florida. This instrument operates with a rotating field claimed to induce a charge upon the surface of the magnetic particles in the water. These particles then fail to grow and are swept through the system without adhering to the equipment surfaces. Both products were tested in standard scaling runs.

B. Measurement of Scale Prevention Effectiveness

The method for evaluating the success of scale prevention was to:

- Prepare a standard simulated geothermal scaling brine at approximately 350°F (177°C)
- Establish a reference heat transfer coefficient decay time curve for this brine in two heat exchange systems
- Add trace quantities of scale control agents or otherwise modify this standard brine and redetermine the coefficient decay time curve to measure the effect of the change upon scaling in the systems.

Two heat exchanger systems were used. One consisted of a vertical U-tube exchanger with the simulated geothermal brine on the shell side. The other was a horizontal series of three small or mini-exchangers in series, each having four straight tubes. The hot brine flowed through the tube side of these in four separate streams. All exchangers were cooled by Brazos River water.

Hot brine and cooling water flow rates were measured for the total flows in the vertical U-tube exchanger. Inlet and outlet temperatures were recorded for both fluids, thus treating the exchanger as a single unit. The mini-exchangers were treated as multiple units with flow rates and temperatures being measured for each of the twelve tubes enabling the calculation of heat transfer coefficients for each individual tube.

Normal methods^{6,7} were used for the calculation of the heat exchange coefficients with the assumption that heat is transferred by conduction only. The transfer coefficient is calculated from the basic equation.

$$M = \frac{Q}{(MTD)(A)}$$

where Q is the average heat flux, MTD is logarithmic mean temperature difference and A is the effective heat transfer area. The logarithmic mean temperature differences are calculated using standard formulae. A fortran computer program was written to calculate the heat transfer coefficients for the vertical heat exchanger, each of the twelve tubes, and for the total of each of the three mini-exchangers.

The physical constants utilized in the program; specific gravity, viscosity and heat capacity for the brine were taken from data in Office of Saline Water reports^{8 9 10} on elevated temperature sea water and from the Chemical Engineers Handbook¹¹.

III. Description of Process and Equipment

A. Preparation of Simulated Geothermal Water

The simulated geothermal brine was prepared in the manner described in a previous report on oxidation of hydrogen sulfide in simulated geothermal brines¹².

The problems of mixing and heating a simulated geothermal brine are primarily physical in that many of the components are soluble only in the high-temperature, high-pressure state. Chief among these are silica and calcium carbonate. The solution adopted to solve this problem was the preparation and deaeration of a base sodium chloride solution with certain nonscaling cations added, heating this base brine to temperature through a steam heat exchanger, injected concentrated and deaerated solutions of the other desired components into the exit stream of the exchanger and mixing just downstream with in-line mixers. The resulting stream then represents a simulated flow from a geothermal well with the advantage of wide variations in composition and temperature.

The source of salt was "chlorine cell feed", a 26% sodium chloride brine from a salt dome solution mining process. The brine is treated to remove calcium and thus contains 1,200 to 1,800 ppm sulfate. A batch process utilizing barium chloride to precipitate the sulfate as barium sulfate was used to lower the sulfate levels to allow calcium addition without scaling in the heat exchanger. A typical composition of the Dow salt dome treated brine is given in Table 1.

This concentrated brine was diluted with Dow steam condensate. Chloride solutions of the desired cations such as calcium, iron, etc. were added to the base brine solution prior to deaeration.

TABLE I
COMPOSITION OF DOW SALT DOME TREATED BRINE

<u>Constituent</u>	<u>ppm</u>
CO ₂	100
H ₂ S	1
Na	102,000
K	350
Li	10
Ca	3-6
Mg	0-1
Fe	1-3
Cl	158,000
Br	10-20
I	1
SO ₄	1,200-1,800
HCO ₃	100
SiO ₂	0-10
H ₃ BO ₄	0-10
TDS	~260,000

The anions, prepared as concentrated solutions of the sodium salts, were injected into the hot flowing brine stream. The primary anion solution contained 5% sodium silicate and 10% sodium bicarbonate. Technical grade hydrochloric acid (HCl) was injected to adjust pH. All solutions were deaerated with nitrogen and stored under a nitrogen pad prior to injection.

B. Equipment

A schematic diagram for water preparation and heat exchange studies is shown in Figure 1. This shows the 10,000 gallon holding tank, omitting the deaerator to save space, and the two heat exchanger systems. The single simulated geothermal brine stream is divided by means of an orifice meter loop and dp cells to pass one gallon per minute through the shell side of the vertical heat exchanger with the remaining flow passing to the mini-exchanger. Here, this flow is divided again by the same technique to pass equally through the four tubes of the mini-exchanger series.

All equipment is of conventional design but constructed to avoid exposure of the brine to corrosive surfaces. All connecting piping is polytetrafluorocarbon-lined. The heat exchanger is constructed of titanium.

The brine flow into the brine heater is supplied by a 316 stainless steel, triple positive displacement pump, Model 431, manufactured by the CAT Pump Corporation. The flow rate is modified by changing pump or motor pulleys. A pulsation dampener is included to provide a more uniform flow.

The anion solution, the HCl, and additives were injected with Model Milroyal D chemical injection pumps. The pump chambers and the injection tubing are of Hastelloy® C or B to avoid corrosion and contamination.

Mixing the anion, acid and additive solutions into the brine was accomplished by an in-line mixer. This mixer is an ISG (Interfacial Surface Generator) mixer of Dow design, manufactured by Charles Ross & Son Company of Hauppauge, New York. The ISG mixer consists of a series of stationary mixing elements enclosed in a pipe housing. Each unit has four passage holes at oblique angles. The ends of the elements are shaped such that adjacent elements form a tetrahedral chamber. A photograph of a disassembled mixer is shown in Figure 2.

Figure 1. Diagram of brine preparation system. Deaerator not included.

Figure 2. IGS Static In-Line Mixer manufactured by Charles Ross and Son. Six (6) units illustrated divides a two-layer stream into 8192 layers.

The unit was a polytetrafluoroethylene, 5.08 cm (2 in.) diameter with six elements. The number of layers emerging, L , can be calculated by the equation $(L=N(4)^E)$ where N is the number of streams and E is the number of elements. Thus a two-layer stream through a six-element mixer results in 8192 emerging layers, giving effective mixing. Pressure drop across each mixer was calculated at 0.015 kg/cm^2 (0.22 psi). Operating pressure of the system is 14.06 kg/cm^2 (200 psi) with a pressure drop of approximately 3.52 kg/cm^2 (50 psi) across the entire system at an 11.4 liter-per-minute (3 gallon) flow rate.

Samples from the sample points following the mixer were taken into evacuated, 350 ml., polytetrafluoro-carbon-lined, stainless steel bombs. The sample valves were Anderson, Greenwood and Company 316 stainless steel, Model M9, gauge valves.

The vertical heat exchanger was shop built U-tube design with three-quarter inch tubes of Alloy 20 and a mild steel shell. A photograph of the tube bundle is shown in Figure 3. This exchanger was equipped with a level controller to provide a gas space above the brine on the shell side. Total heat exchange area of the U-tubes was evaluated to be 15.8 sq. ft. at 100% full level. This area was corrected for the actual level used in the runs.

The three mini-exchangers, arranged in series, and shown in Figure 4 contained four three-quarter inch O.D., 0.035 inches thick E-brite® alloy tubes except for runs intended for tube sectioning. In these runs aluminum tubes were used. The tubes were not rolled into the headers but were attached by a special Swedgelock® fitting which compresses a high temperature rubber stopper around the tube and screws into the drilled and tapped header. This enables easy removal of the tubes for cleaning or sectioning. A photograph of this tube holder is shown in Figure 5. Such connections have been tested in this laboratory to 300 psi and found to be safe. Heat exchange area of each tube was calculated to be 0.915 sq. ft.

A problem of deposition on the cooling water side of the heat exchange surfaces was encountered in the initial test runs. This was due to suspended silt particels in the river water used for cooling. The problem was eliminated by installing 25 micron filters in the cooling water lines and injecting 10 ppm Ameroyal®, a Drew Chemical Company surfactant, into the filtered cooling water streams.

Figure 3: Photograph of Tube Bundle From Main Vertical Heat Exchanger Showing Scale Deposit on Tubes

Figure 4. Photograph of mini-exchanger series with flow from right to left.

Figure 5. Swedgelock® tube fitting for mini-exchanger tube installation.

IV. Experimental Results and Conclusions

A. General

The emphasis is placed on the data from the three mini-exchangers arranged in series. The U-tube or main vertical heat exchanger was also used in the runs as specified but it is believed that the mini-exchangers give the most valid data. Computer printouts of all the heat exchange data for the 54 successful runs including some cooperative work with Los Alamos Scientific Laboratory are included in Appendix A.

Some runs terminated early due to plugging resulting in high pressure shut down. This plugging occurred primarily in the in-line mixer and resulted from calcium carbonate apparently formed by the pressure drop across the mixer. Theoretically the pressure drop should be 0.015 kg/cm^2 (0.22 psi).

This is a very small pressure drop, which brings up the question of complete solution of the silica and carbonate prior to arriving at the mixer. Repeated sampling of the feed going to the mixer gave a clear solution free of solids. Colorimetric analysis for silica; which should detect only monomeric silica, agreed well with total silica analyses. However, some reasonable doubt can exist that complete solubility of all components was achieved.

B. Determination of Clean Surface Heat Transfer Coefficients and System Check-Out

Runs were made with 30,000-43,000 ppm sodium chloride containing no added ingredients other than those naturally occurring in the treated low sulfate salt dome brine to determine clean surface heat transfer coefficients for the system. These runs were made at intervals throughout the program using different conditions. In general these runs showed no coefficient change with time, indicating no scaling as would be expected. The runs of this nature were numbers 2, 5, 19, 28, 34, and 41. Table II is a summary of the results.

The first four runs were made with split flow, 1.0 gpm flow to the main U-tube exchanger and 1.6 gpm to the mini-exchangers. The total flow of 2.6 gpm passed through the mini-exchangers in the last two runs. Heat exchange coefficients varied between runs, as could be expected, but remained essentially constant

TABLE II
SUMMARY OF RESULTS OF NON-SCALING RUNS
Total Flow, 2.6 gpm

<u>Run No.</u>	<u>TDS, ppm</u>	<u>U-Tube, Hy</u>	<u>Typical Coefficient, Btu/hr.sq.ft.°F</u>			<u>Remarks</u>
			<u>Mini #1</u>	<u>Mini #2</u>	<u>Mini #3</u>	
2	36,000	120	92	77	60	No insulation on mini-exchanger
5	43,000	110	90	80	61	-----
19	30,000	135	115	100	75	Cooling water scaled main exchanger
28	31,000	125	120	100	87	-----
34	30,000	---	167	160	136	Total flow through mini-exchanger
41	30,000	---	185	175	158	Total flow through mini-exchanger

for any one exchanger. Some difficulty was experienced in balancing equal flow between the four tube systems of the mini-exchangers due to inherent problems of DP cell operation with hand-controlled valves. This is a problem common to all runs.

C. Definition of Scaling Conditions and a Standard Scaling Composition

The objective of these experiments was to establish a standard scaling composition to use as a basis for runs designed to modify the formation of scale as measured by the decay of the heat exchange coefficients. An auxiliary purpose was to determine the effect of total salinity on scale formation in this system and also the effect of calcium carbonate formation on the silica scaling based on the idea of calcium carbonate solids being a seeding factor in bringing down the silica.

Runs numbered 3, 4, 6, 7, 8, 9, 10, 19, 35, 38, 39, and 43 furnished data of this nature. Table III is a summary of the compositions of these runs.

Both heat exchanger systems were used in the first 30 runs with the exception of run 29 made for Los Alamos Scientific Laboratory. The flow was split such that 1.0 gpm passed through the main or U-tube exchanger and 1.6 gpm passed through the four tubes of the mini-exchangers. This, of course, resulted in very low rates of flow, approximately one hour residence time in the shell of the main exchanger and 0.29 ft/sec. in the tubes of the mini-exchanger. After the 30th run, work intended for the main exchanger had been completed, so the total flow was diverted to the mini-exchangers to increase the flow rate to 0.47 ft/sec. This was still a lower than desired flow but represented the maximum capability of the system.

Runs 6, 8, 9, and 10 were standard scaling runs with split flow as previously described. Curves of heat exchange coefficients versus time for the three mini-exchangers and the main exchanger are plotted in Figure 6 shown as four different figures (6-1, 6-2, 6-3, and 6-4) for simplification. These curves show considerable scatter even though every attempt was made to keep flows of cooling water and other variables constant. Runs 8 and 9 were chosen as standard reference runs for comparison with experiments using split flow.

TABLE III
COMPOSITION OF STANDARD SCALING RUNS

Run No.	Run Date	Run Time, hrs.	TDS, ppm	Ca, ppm	SiO ₂ , ppm	CO ₂ , ppm	pH	Flow, ppm		Remarks
								Main	Mini	
3	12/9/76	52	50,000	None	350	700	8.1	1	1.6	
4	12/14/76	23	33,000	None	500	1000	8.7	1	1.6	
6	2/10/76	28	28,000	58	400	800	6.0	1	1.6	
7	3/2/77	5	26,000	34	300	600	6.9	1	1.6	
8	3/3/77	26	26,000	34	300	600	6.9	1	1.6	
9	3/9/77	39	45,000	24	400	800	7.1	1	1.6	
10	3/30/77	16	50,000	20	400	800	7.1	1	1.6	
35	11/2/77	10	30,000	34	400	800	7.0	0	2.6	
38	12/14/77	38	30,000	32	415	830	7.8	0	2.6	
39	12/21/77	47	30,000	32	400	800	8.6	0	2.6	
43	1/24/78	6.6	34,000	24	360	720	6.5	0	2.6	

FIGURE 6-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 6-2
MINI EXCHANGER3
OVERALL HEAT TRANSFER COEF.

FIGURE 6-3
MINI EXCHANGERS
OVERALL HEAT TRANSFER COEF.

FIGURE 6-4
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

Increasing the flow through the mini-exchangers to 2.6 gpm by eliminating the main exchanger from the system required a new standard reference run. This was Run Number 35. These three curves, one for each mini-exchanger are plotted in the Figure 7 series and were used as reference curves for experiments where this flow system was employed.

It was believed that calcium content would be important to scaling on the basis that calcium carbonate solids would tend to seed the formation of silica scale. Runs 3 and 4 were made with the silica, 350 ppm and 500 ppm respectively, added along with corresponding amounts of carbonate but with no calcium ions present. Results of these runs are compared with standard runs 9 and 10 in the Figure 8 series. These data indicate the possibility, but do not definitely prove, that calcium does enhance the silica scaling.

This concept was pursued at a later date using the mini-exchangers only. These experiments involved adding ethylene diamine tetraacetic acid (EDTA) as the sodium salt at concentrations calculated to exceed by 10% in Run 38 and 50% in Run 39 all chelateable cations in the solution as determined by EDTA titration for total hardness. This should tie up the calcium and prevent precipitation of calcium carbonate seed particles. Results of these experiments are plotted in the Figure 9 series.

The most noticeable effect of chelating calcium and other ions with EDTA was to prolong the run time apparently by preventing plugging and high pressure shutdown which normally was the limiting factor. Heat exchange also appeared to have been improved. These experiments taken with the previously described experiments using no calcium addition tend to support the calcium carbonate seeding theory. Though scale still formed in both cases, it was less severe in the absence of calcium ions even at the very low, 20-30 ppm, levels used in the standard scaling runs.

The nature of the scale formed has a significant effect on the validity of the experimental results. Unfortunately, firmly adhering, hard scale was not obtainable under these temperature and run time limitations. The actual scale was a whitish-grey hydrous solid adhering very loosely to the heat

FIGURE 7-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 7-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 7-3
MINI EXCHANGERS
OVERALL HEAT TRANSFER COEF.

FIGURE 8-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 8-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 8-3
MINI EXCHANGER3
OVERALL HEAT TRANSFER COEF.

FIGURE 8-4
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 9-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 9-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 9-3
WIMI EXCHANGER3
OVERALL HEAT TRANSFER COEF.

exchange surfaces. However, it was evenly distributed, indicating that it was not being formed by settling of a precipitate. Figure 10 is a photograph of a typical scale taken at 1000x enlargement. No differences were observed in photographs of scale formed from standard and those without calcium added or with various additives tested.

Composition of the scale was investigated. The primary component was always amorphous silica. Calcium as the carbonate was present in the 3-5% range in the typical run. Significant amounts of magnesium, probably from the salt dome brine were found. Other elements were present in trace amounts, generally less than 25 ppm.

A study was performed on scale distribution and its composition as cooling progressed down the mini-exchanger. This run, Number 48, was made with aluminum tubes to facilitate tube sectioning. The brine composition was 33,000 ppm TDS with 21 ppm calcium, 400 ppm silica and 800 ppm carbonate as CO_2 . The upper left-hand tube and the lower right-hand tubes of all three exchangers were cut into 7-inch sections, air dried at 50% relative humidity for 100 hours, weighed, cleaned and then reweighed to determine the scale distribution down the exchanger series. The recovered scales were analyzed to study composition changes. Figure 11 is a plot of the weight versus distance down the system. Table IV. is the results of the analyses. It was necessary to combine scale from sections to obtain enough sample for analysis. It also should be noted that these samples could not be washed to remove supernatant brine without disturbing the scale distribution so sodium chloride is a significant portion of the solids.

The distribution shows high scale deposition in the first exchanger decreasing down to an almost constant rate in the third exchanger.

The analyses showed definite trends relative to silica and calcium content. The silica tended to increase down the tube system whereas the calcium followed a reverse trend apparently tending to form predominantly in the hotter portion of the exchanger. Magnesium followed the same trend as the calcium.

Figure 10. Photograph of typical scale formed in the mini-exchangers taken at 1000x magnification.

Figure 11
Scale Distribution in the Three Mini-Exchangers

TABLE IV
ANALYSIS OF SCALE FROM SECTIONED TUBES OF RUN NO. 48
USING KENICS MIXER IN TUBE NO. 4

<u>Tube No. 1</u>						
	<u>Exchanger No. 1</u>			<u>Exchanger No. 2</u>		<u>Exchanger No. 3</u>
	<u>0-14"</u>	<u>14"-35"</u>	<u>35"-56"</u>	<u>0-28"</u>	<u>28"-56"</u>	<u>0-56"</u>
%SiO ₂	37.3	53.5	54.2	54.6	Sample Test	58.7
%Ca	7.6	5.0	3.8	3.4	Sample Test	1.5
%Mg	5.1	2.7	2.0	0.6	Sample Test	0.5
%Na	4.3	6.2	7.8	8.3	Sample Test	4.6
%Cl	6.0	7.6	9.8	12.4	Sample Test	Insuff. Sample
 <u>Tube No. 4</u>						
%SiO ₂	41.6	56.0	58.0	59.0	59.4	62.0
%Ca	7.4	5.1	4.1	2.7	3.1	1.4
%Mg	5.1	2.1	2.1	0.5	1.8	0.3
%Na	4.1	6.1	7.0	10.0	6.8	8.7
%Cl	5.7	8.3	9.2	14.2	Insuff. Sample	11.7

Since the scale distribution showed the rate of scale formation to be much higher in the first exchanger, the calcium apparently drops out very early in the hotter section.

D. Testing of Scale Control Additives

Prevention of general water hardness scale by the addition of trace additives has long been practiced in heat exchangers of various types. Numerous additives, primarily organic surface active agents and phosphate derivatives, are marketed for this application. These are particularly effective for calcium carbonate, magnesium hydroxide and iron oxide scaling.

Numerous companies marketing these products were contacted and asked to submit samples for screening in this project. The samples received were tested at the addition levels recommended. Samples tested and conditions of the test are listed in Table V. Data from these runs may be found in Appendix A. Curves of the heat exchange coefficients are shown in Figures 12 through 17 where the heat exchanger series are plotted along with the appropriate standard scaling runs.

Generally, all the additives seemed to give better heat exchange coefficients for short times. However, only two, Calgon-165 and Dequest 2060 had any lasting effect. These two, shown in Figure 14 and Figure 17, did appear to effect scaling tendency throughout the runs. Both were recommended at the 10 ppm level. Runs were made at or near this level and then at approximately twice the recommended level of addition. Both additives gave better results at the recommended levels. These two additives deserve further investigation in actual geothermal brine systems. No conclusions can be drawn as to how these inhibitors are functioning but it is assumed that the primary action is related to inhibition of calcium carbonate scaling. Energy dispersive X-ray analysis scans of the scales formed by these runs were identical to those of the standard runs. This indicates no effect on scale composition resulted from the additives.

E. Electrostatic and Electromagnetic Instruments

Attempts were made to test an electronic water treater manufactured by Progressive Equipment Corporation of

TABLE V
SCALE CONTROL ADDITIVES TESTED

<u>Additive</u>	<u>Added, ppm</u>	<u>Run No.</u>	<u>Run Time, hrs.</u>	<u>pH</u>	<u>TDS, ppm</u>	<u>Calcium, ppm</u>	<u>Silica, ppm</u>	<u>Carbonate, ppm</u>
Betz 403	90	11	24	7.1	31,000	22	445	890
Hercules AF-504	20	12	23	7.0	32,000	28	420	840
Belgard E.V.	20	13	7.5	6.8	31,000	21	420	840
Dow Corning Siliconate	20	14	37	6.8	31,000	21	420	840
Calgon CL-165	13	20	53	6.9	30,000	20	410	820
Calgon CL-165	25	23	42	7.0	31,000	22	500	1000
Calgon CL-165	12	27	12	6.9	33,000	20	420	840
Ammonium Bifluoride	32	21	24	6.9	32,000	20	425	850
Methylene Sulfonic Acid	25	22	10	7.0	30,000	22	440	880
Polyethyleneamine- 18-Itaconic Acid	12	26	23	6.8	29,000	20	420	840
Thermosal APS	13	52	20	6.9	30,000	24	400	800
Dequest 2060	10	53	28	6.7	32,000	25	400	800
Dequest 2060	20	54	23	6.7	32,000	25	400	800

FIGURE 12-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 12-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 12-3
MINI EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 12-4
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 13-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 13-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 13-3
MINI EXCHANGER3
OVERALL HEAT TRANSFER COEF.

FIGURE 13-4
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 14-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 14-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 14-3
MINI EXCHANGER3
OVERALL HEAT TRANSFER COEF.

FIGURE 14-4
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 15-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 15-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 15-3
MINI EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 15-4
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 16-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 16-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 16-3
MINI EXCHANGERS
OVERALL HEAT TRANSFER COEF.

FIGURE 17-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 17-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 17-3
MINI EXCHANGER3
OVERALL HEAT TRANSFER COEF.

Erie, Pennsylvania. This instrument has been previously described. It was installed in the simulated geothermal brine flow line just prior to the point of division of the flow to the two heat exchange systems.

Run Number 15 was intended to test this piece of equipment. The control assembly included a red light to indicate malfunction due to shorting between the electrodes. After a few minutes of operation at 350°F the light indicated a short had occurred so the run was terminated. Consultation with the supplier resulted in this unit being replaced by a similar type but stated to have higher operating temperature limits. The new unit gave the same short signal as soon as the flow reached full temperature. No solution to this problem was forthcoming so attempts to test this equipment were abandoned.

A second type of "black box" instrument was purchased from Electronic Water Conditioners, Inc. of Miami, Florida. This device, previously described, was reported to operate on an electromagnetic principle using a rotating magnetic field. The trade name was Electro-Mag.

Run Number 37 was a standard scaling run designed to test this apparatus. Results of this run compared to the standard Run Number 35 are shown in the Figure 18 series. Inspection of the curves indicates no effect on the heat exchange values and visual inspection of the tubes indicates typical scale formation. No further work was done in this area.

F. Scale Control by Prevention of CaCO_3 Formation by CO_2 Overpressure in the Main Exchanger

This approach was undertaken as described in the Technical Approach section. A standard scaling brine was used with 33,000 TDS, 22 ppm calcium, 410 ppm silica and 820 ppm carbonate. The main heat exchanger was operated at 80% of full with a 150 psig carbon dioxide pad above the brine level. Runs numbered 16 and 17 were the experiments of this nature. As the runs progressed, a considerable carbon dioxide demand was noted in both runs indicating the gas was dissolving into the brines. A check of pH showed this to be the case as the pH, initially 7.0, fell to the 5.5 to 6.0 pH unit region.

FIGURE 18-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 18-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 18-3
MINI EXCHANGER3
OVERALL HEAT TRANSFER COEF.

The heat exchange values for the main exchanger only for these runs is plotted in Figure 19 and compared with the results of Standard Runs 8 and 9. Little or no scaling is indicated. Visual inspection of the tube bundle following each of the runs confirmed a non-scaling condition existed in the main exchanger while copious scaling occurred in the unaffected mini-exchangers.

These runs were successful scale prevention runs. However, it is believed that the carbon dioxide simply acted as an acidic gas to lower the pH which prevented not only calcium carbonate formation but also shifted the silica polymerization equilibrium toward the soluble monomer form and thus prevented silica scaling by that mechanism. This suggested pH control with the hydrochloric acid injection as a possible scale prevention technique. Experiments of this type are described below.

G. Scale Control by Acidification with Hydrochloric Acid Injection

Runs were made using standard scaling conditions but adjusting the hydrochloric acid pump to give pH values of 5.0 and 6.0 to compare with the Standard Run Number 35, which was made at pH 7.0. The results of these runs, Numbers 32 and 33, along with Number 35 are plotted in the Figure 20 series.

Lowered pH did indeed do a good job of preventing scaling in this system. A few streaks of solids were found in the first mini-exchanger tubes but the tubes in the second and third exchangers were clean. This suggests that acidification could be a viable means of preventing scaling in geothermal systems where the scale forming elements are calcium carbonate and silica.

H. Prevention of Scaling by Seeding with Calcium Sulfate

This method was based on the concept that copious seeding would tend to promote formation of very small silica and other particles in the body of the water and that these particles would be swept through the system without adhering to the surfaces. The seeding material chosen was calcium sulfate. These particles, due to inverse solubility, could be redissolved in the cooled brine thus preventing down-stream solids problems. The calcium level was

FIGURE 19
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 20-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 20-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

OVERALL HEAT TRANSFER COEF.

U, BTU / HR FT2 DEGF

300.

225.

150.

75.

0.

0. 5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0 45.0 50.0 55.0

Run Time, Hours

LEGEND:

2 3 RUN 33-PH 6.0 10-12-77

2 2 RUN 32-PH 5.0 10-5-77

1 RUN 35-STD SCALING 11-2-77

chosen at 20 ppm as in the standard scaling composition. A sulfate addition of 24 ppm was calculated to give calcium sulfate precipitation in the hot brine and redissolution after cooling.

The results of this run are shown in the Figure 21 series. No effect on scaling was observed in terms of heat exchange characteristics, although some slight improvement was noted in the main exchanger. Examination of the exchanger revealed typical scale formation. The scale, analyzed by energy dispersive X-ray scanning showed the usual composition. No sulfate was detected indicating the calcium sulfate redissolved or did not scale. This method was apparently ineffective in scale prevention.

I. Effect of Turbulent Flow on Scale Formation

Several experiments were performed at the request of the Los Alamos Scientific Laboratory for their computerized modeling of scaling variables. One of the most informative experiments involved introduction of turbulence into one of the four tubes of the Number One mini-exchanger to wash away the amorphous scale.

A Static Mixer® for this purpose was designed by Kenics Corporation. It consisted of a 40-element bundle 48 inches long constructed of 304 stainless steel and precision ground to fit inside a 3/4-inch O.D. x 0.035-inch wall heat exchanger tube. This mixer was installed in the lower right-hand tube of the first mini-exchanger.

A non-scaling brine-only run, Number 45 and a standard scaling run, Number 46, was made to test the effect of turbulence. The heat exchange values of the Kenics mixer tube, Tube Number 4, and the average of that of the other three tubes is compared in Figure 22. The turbulence increased the coefficient of heat exchange on the blank run from an average of 150 to 275 Btu/hr.ft²F°. However, the scaling run showed little or no effect due to the turbulence in Tube 4 with the heat transfer decaying rapidly in both cases. This indicated that the scale is of such nature that higher flow rates would have little effect on scaling tendency.

V. General Conclusions

Suppression of scaling in heat exchange systems using simulated geothermal brine at 350°F has been studied

FIGURE 21-1
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

FIGURE 21-2
MINI EXCHANGER2
OVERALL HEAT TRANSFER COEF.

FIGURE 21-3
MINI EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 21-4
MAIN EXCHANGER
OVERALL HEAT TRANSFER COEF.

FIGURE 22
MINI EXCHANGER1
OVERALL HEAT TRANSFER COEF.

by methods consisting of commercial scale prevention additives, carbon dioxide overpressure in the exchanger, pre-seeding with calcium sulfate nuclei and electrical or magnetic scale prevention devices. Effectiveness was based on decay of heat exchange coefficient with time.

The nature of scale formed from the simulated brine was essentially a hydrous silica with low levels of calcium carbonate and traces of magnesium and iron compounds. This scale was equally distributed on the tube surface but was not adhering and was easily removed by flushing with a low pressure water hose.

Of the ten additives tested, two appeared to have a significant effect on scale formation. These were Calgon CL-165 and Monsanto Dequest 2060. These additives are reported to primarily prevent calcium carbonate scaling. Their effect was to decrease the heat exchange decay rate but copious scale still formed. Further testing in actual geothermal water would, however, appear to be justified.

Overpressure with carbon dioxide above the simulated geothermal brine in the exchanger to prevent decomposition of biocarbonate ions to form carbonate ion and thus precipitate calcium carbonate was very successful in preventing scaling. However, the primary action of the carbon dioxide appeared to be the lowering of the pH of the brine from pH 7 to pH 5 to 6 through the adsorption of the carbon dioxide.

This suggested acidification with acid. Trials of this concept using hydrochloric acid confirmed that, at least in this system, scale did not form in either type exchanger at pH values below pH 6. However, since geothermal waters are highly buffered, acid addition does not appear to be an economic way of controlling scale. Also, serious corrosion problems would result at this pH range.

Attempts to control scaling using electrical and magnetic devices were unsuccessful. The electrical device failed in operation and scaling was unaffected by the magnetic device tested.

Seeding with calcium sulfate nuclei gave no discernable scale control. Increasing turbulence in an exchanger tube containing the flowing brine stream increased heat exchange rate but did not decrease the scale formation rate.

The result of this work indicates that scaling can be controlled by acidification to pH 6 or lower. Two additives, Calgon CL-165 and Monsanto Dequest 2060, showed promise of having some scale control properties but fell short of the desired degree of control. These two additives do warrant further testing in actual geothermal waters.

BIBLIOGRAPHY

1. Shannon, D. W., "Economic Impact of Corrosion and Scaling Problems in Geothermal Energy Studies", Pacific Northwest Laboratories, Battelle, BNWL-1866UC-4 (1975).
2. Holland, H. D., "Ganque Minerals in Hydrothermal Deposits", Chapter 9 in Geochemistry of Hydrothermal Ore Deposits, H. L. Barnes (ed.) Holt, Reinhart and Winston, Inc. pp 382-436.
3. Barnes, H. L., W. F. Downs, J. D. Rimstidt and D. O. Hayba, "Control of Silica Depositions in Geothermal Systems", Annual Report on Grant GO-155140-1 to the U.S. Bureau of Mines, July, 1977.
4. Wilson, J. S., B. P. Shepard and S. Kaufman, "An Analysis of the Potential Use of Geothermal Energy for Power Generation Along the Texas Gulf Coast", NTIS PB-243 324, Texas Governors Energy Advisory Council, Austin, Texas, 1974.
5. Welder, B. Q. and E. P. Partridge, "Practical Performance of Water-Conditioning Gadgets", Ind. Eng. Chem. 46, 954-960 (1954).
6. EICHe Equipment Testing Procedure Heat Exchangers, Second Edition, 1969.
7. Heat Exchanger Tube Manual, Third Edition, Scovill Manufacturing Co., Waterbury, Connecticut, 1957.
8. Fabuss, B. M. and A. Korasi, "Properties of Seawater and Solutions Containing Sodium Chloride, Potassium Chloride, Sodium Sulfate and Magnesium Sulfate", U.S. Department of the Interior, Office of Saline Water, R&D Report No. 384, 1968.
9. Bromley, L. A., "Further Studies of Properties of Seawater and Its Concentrates to 200°C", U.S. Department of the Interior, Office of Saline Water, R&D Report No. 552, 1970.
10. Bromley, L. A., "Properties of Seawater and Its Concentrates and Related Solutions at Temperatures Up to 400°F", U.S. Department of the Interior, Office of Saline Water, R&D Report No. 747, 1972.
11. Chemical Engineers Handbook, Fifth Edition, McGraw-Hill, New York, NY, 1973.
12. Wilson, J.S., J. E. King and G. R. Bullard, "Removal of Hydrogen Sulfide from Simulated Geothermal Brines by Reaction with Oxygen", The Dow Chemical Company, Final Report ERDA Contract No. EY-76-C-02-2797, April 1977.

APPENDIX

THIS IS THE INPUT DATA FOR THE FIRST RUN
THIS RUN STARTED OCTOBER 20, 1976
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 375 PPM
D. CARBONATE: 750 PPM
E. PH : 10.2
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER : NO INSULATION ON THE MINI EXCHANGERS

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.1	7.1	7.1	7.1	3.	86.0	107.5	75.0	86.0	67.5	75.0
1.58	7.2	7.1	7.2	7.2	3.	89.0	109.0	77.0	89.0	70.5	77.0
2.35	7.2	7.2	7.2	7.2	3.	89.0	110.0	77.5	89.0	70.5	77.5
3.05	7.3	7.2	7.3	7.2	3.	89.0	109.0	77.5	89.0	70.5	77.5
5.85	7.2	7.2	7.3	7.2	3.	83.0	104.0	72.0	83.0	65.5	72.0
18.17	7.1	7.1	7.2	7.1	3.	73.0	91.0	64.0	73.0	58.0	64.0
20.17	7.1	7.1	7.1	7.1	3.	76.5	93.5	67.0	76.5	61.0	67.0
21.57	7.1	7.2	7.2	7.1	3.	81.0	99.0	71.0	81.0	65.0	71.0
23.17	7.2	7.3	7.2	7.3	3.	85.0	103.0	75.0	85.0	69.0	75.0
24.57	7.3	7.3	7.3	7.2	3.	87.0	105.0	77.0	87.0	71.0	77.0
26.38	7.4	7.5	7.4	7.4	3.	88.0	107.0	79.0	88.0	72.0	79.0
35.00	7.6	7.7	7.6	7.6	3.	80.0	99.0	72.0	80.0	67.0	72.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
320.0	227.5	323.0	228.0	320.0	238.0	320.0	243.0	227.5	184.5	228.0	182.0	238.0	176.0	243.0	172.5
322.5	233.0	325.0	232.0	322.5	244.0	322.0	246.5	233.0	190.5	232.0	187.5	244.0	184.0	246.5	181.0
324.5	236.0	327.0	233.0	324.5	247.0	324.5	249.0	236.0	193.5	233.0	191.0	247.0	187.0	249.0	184.0
322.0	236.0	325.0	235.0	322.0	244.0	322.0	247.5	236.0	193.0	235.0	190.0	244.0	186.5	247.5	184.5
326.0	240.0	329.0	238.0	326.5	249.0	326.0	250.0	240.0	195.0	238.0	194.0	249.0	190.5	250.0	178.0
325.0	247.5	327.0	244.0	324.5	251.0	325.0	253.0	247.5	204.5	244.0	203.5	251.0	200.0	253.0	199.5
329.5	252.0	330.0	250.0	328.0	255.0	328.0	258.0	252.0	211.0	250.0	209.0	255.0	205.0	258.0	205.0
329.0	253.0	331.0	250.0	329.0	256.0	329.0	259.0	253.0	211.0	250.0	211.0	256.0	207.0	259.0	207.0
331.0	253.0	331.0	252.0	331.0	257.0	331.0	259.0	253.0	212.0	252.0	213.0	257.0	209.0	259.0	209.0
331.0	255.0	332.0	253.0	332.0	259.0	331.0	261.0	255.0	215.0	253.0	215.0	259.0	211.0	261.0	210.0
333.0	255.0	333.0	253.0	333.0	261.0	333.0	262.0	255.0	216.0	253.0	216.0	261.0	213.0	262.0	213.0
326.0	250.0	328.0	249.0	328.0	260.0	326.0	260.0	250.0	213.0	249.0	213.0	260.0	213.0	260.0	211.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
184.5	147.5	182.0	149.0	176.0	147.0	172.5	148.0
190.5	154.5	187.5	155.0	184.0	153.5	181.0	154.0
193.5	157.0	191.0	158.5	187.0	156.0	184.0	158.0
193.0	157.0	190.0	158.5	186.5	156.5	184.5	157.5
195.0	160.5	194.0	161.0	190.5	159.5	178.0	162.0
204.5	170.0	203.5	172.0	200.0	168.0	199.5	170.0
211.0	175.0	209.0	177.0	205.0	172.0	205.0	175.0
211.0	179.0	211.0	179.0	207.0	176.0	207.0	178.0
212.0	179.0	213.0	183.0	209.0	178.0	209.0	180.0
215.0	183.0	215.0	184.0	211.0	181.0	210.0	183.0
216.0	184.0	216.0	186.0	213.0	183.0	213.0	184.0
213.0	181.0	213.0	183.0	213.0	183.0	211.0	183.0

RESULTS FROM THE FIRST RUN
THIS RUN STARTED OCTOBER 20, 1976
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 375 PPM
D. CARBONATE: 750 PPM
E. PH : 10.2
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER : NO INSULATION ON THE MINI EXCHANGERS

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
2266.0	166.6	164.3	165.5	164.3	.00	90.4	90.7	76.7	70.3	82.0	.00
2245.3	167.6	166.2	168.1	167.2	1.58	84.6	87.0	71.7	68.1	77.9	1.58
2264.8	167.4	166.3	167.9	167.0	2.35	84.6	89.7	71.7	69.0	78.8	2.35
2265.3	168.8	167.6	169.7	168.1	3.05	81.7	84.7	72.6	67.9	76.7	3.05
2193.2	168.0	168.0	169.4	168.2	5.85	77.5	82.0	68.4	64.5	73.6	5.85
2236.2	165.1	164.9	166.5	164.6	18.17	62.1	66.8	58.8	56.6	61.1	18.17
2235.1	165.2	165.6	165.3	164.4	20.17	60.6	63.0	56.8	53.7	58.5	20.17
2381.5	165.9	167.4	166.8	165.9	21.57	64.4	69.5	61.6	58.3	63.4	21.57
2416.7	167.4	168.8	167.4	168.1	23.17	67.6	69.3	63.4	61.6	65.5	23.17
2490.1	168.1	168.7	168.7	167.4	24.57	67.9	71.1	64.5	61.2	66.2	24.57
2533.7	172.5	173.5	172.5	172.5	26.38	73.0	75.7	66.2	65.1	70.0	26.38
2530.3	175.9	178.3	176.4	175.7	35.00	72.3	76.0	62.8	60.9	68.0	35.00

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	SO.FT.	DEG. F		HOURS		BTU/HR.	SO.FT.	DEG. F		HOURS
52.3	55.8	75.3	85.1	67.1	.00	65.2	57.4	52.9	44.9	55.1	.00
53.2	56.2	74.9	81.9	66.6	1.58	56.4	51.1	49.7	44.2	50.4	1.58
51.4	51.5	72.3	78.3	63.4	2.35	57.6	51.0	50.8	42.4	50.4	2.35
52.5	55.5	70.8	76.7	63.9	3.05	57.5	50.2	49.7	44.5	50.4	3.05
48.6	48.0	63.1	81.3	60.2	5.85	50.2	48.1	46.5	24.9	42.4	5.85
40.3	38.4	48.5	50.1	44.3	18.17	39.9	36.2	38.3	34.7	37.3	18.17
39.0	39.6	48.2	50.3	44.3	20.17	40.4	35.9	38.3	34.2	37.2	20.17
43.3	40.9	51.1	53.5	47.2	21.57	38.2	38.6	38.3	35.3	37.6	21.57
44.2	42.4	51.7	53.8	48.0	23.17	41.2	37.0	39.3	36.6	38.5	23.17
43.8	42.0	52.9	55.7	48.6	24.57	40.5	39.2	39.0	34.6	38.3	24.57
42.3	40.6	51.8	52.7	46.9	26.38	44.4	41.5	42.3	40.7	42.2	26.38
38.0	37.6	47.1	49.2	43.0	35.00	38.1	35.9	35.5	33.2	35.6	35.00

THIS IS THE INPUT DATA FOR THE FIRST RUN

THIS RUN STARTED OCTOBER 20, 1974

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : 375 PPM
- D. CARBONATE: 750 PPM
- E. PH : 10.2
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- H. OTHER : NO INSULATION ON THE MINI EXCHANGERS

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GAGE
.000	338.0	101.5	5.1	48.0	84.0	7.9
1.583	339.5	104.5	5.0	70.5	88.0	7.9
2.350	341.0	105.5	5.0	70.5	89.0	7.9
3.050	339.0	106.0	4.9	70.5	88.5	7.9
5.850	342.0	104.0	4.9	65.5	83.5	7.9
18.167	339.0	108.0	5.1	58.0	75.0	8.4
20.167	341.5	110.5	5.0	61.0	78.5	8.2
21.567	341.0	112.5	5.0	65.0	81.5	8.2
23.167	342.5	116.0	5.0	69.5	84.0	8.3
24.567	342.5	117.5	5.0	71.5	87.5	8.4
26.383	343.5	118.5	5.0	72.5	88.0	8.4
35.000	339.0	112.0	5.1	66.0	80.0	8.4

RESULTS FROM THE MAIN EXCHANGER FOR THE FIRST RUN

THIS RUN STARTED OCTOBER 20, 1974

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : 375 PPM
- D. CARBONATE: 750 PPM
- E. PH : 10.2
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- H. OTHER : NO INSULATION ON THE MINI EXCHANGERS

BRINE	COOLH2O	BRINE	COOLH2O	OVERALL	RUN
FLOW	FLOW	FLUX	FLUX	HTC	TIME
LB/HR	LB/HR	BTU/HR	BTU/HR	BTU/HR SQFT DEG F	HOURS
446.7	5857.2	104398.3	105218.9	137.3	.00
461.7	5877.3	104630.0	102646.2	131.8	1.58
461.4	5876.1	104792.6	108490.1	135.5	2.35
457.2	5876.7	102733.6	105548.4	130.2	3.05
456.5	5860.1	104791.8	105271.4	121.8	5.85
466.4	6281.3	103922.5	106675.8	101.5	18.17
461.2	6127.5	102800.8	107124.1	102.5	20.17
461.4	6138.8	101722.6	101087.3	101.1	21.57
461.0	6193.0	100790.4	101979.7	103.1	23.17
461.0	6265.7	100132.4	100050.9	102.1	24.57
460.8	6242.7	100881.9	96548.5	100.0	26.38
471.0	6252.7	103160.0	87362.3	94.0	35.00

THIS IS THE INPUT DATA FOR THE SECOND RUN
 THIS RUN STARTED OCTOBER 27, 1976
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 36,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : NONE
 C. SILICA : NONE
 D. CARBONATE: NONE
 E. PH : UNKNOWN
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER : NO INSULATION ON THE MINI EXCHANGERS

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.0	6.7	6.7	7.3	4.	80.0	99.0	71.0	80.0	63.0	71.0
1.33	7.0	7.0	7.0	7.1	5.	80.0	99.0	71.0	80.0	63.0	71.0
2.58	7.0	7.0	7.1	7.1	5.	80.0	99.0	70.0	80.0	63.0	70.0
4.33	7.0	7.0	7.1	7.1	4.	79.0	97.0	69.0	79.0	64.0	69.0
9.83	7.2	7.1	7.1	7.3	4.	78.0	97.0	68.0	78.0	63.0	68.0
20.83	7.4	7.3	7.4	7.4	4.	75.0	93.0	65.0	75.0	59.0	65.0
25.17	7.3	7.3	7.4	7.4	4.	72.0	91.0	63.0	72.0	57.0	63.0
27.33	7.4	7.4	7.4	7.5	4.	74.0	91.0	63.0	74.0	57.0	63.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
327.0	215.0	325.0	213.0	325.0	238.0	325.0	231.0	215.0	171.0	213.0	159.0	238.0	175.0	231.0	161.0
329.0	217.0	329.0	216.0	328.0	239.0	328.0	235.0	217.0	173.0	216.0	163.0	239.0	174.0	235.0	165.0
329.0	218.0	329.0	215.0	329.0	239.0	329.0	235.0	218.0	174.0	215.0	163.0	239.0	175.0	235.0	165.0
329.0	217.0	327.0	217.0	327.0	239.0	327.0	235.0	217.0	173.0	217.0	164.0	239.0	174.0	235.0	164.0
327.0	219.0	326.0	218.0	326.0	241.0	326.0	237.0	219.0	175.0	218.0	165.0	241.0	177.0	237.0	168.0
324.0	221.0	323.0	219.0	323.0	244.0	323.0	240.0	221.0	177.0	219.0	167.0	244.0	179.0	240.0	171.0
325.0	221.0	324.0	221.0	324.0	245.0	324.0	241.0	221.0	177.0	221.0	167.0	245.0	179.0	241.0	169.0
325.0	224.0	325.0	224.0	325.0	247.0	325.0	243.0	224.0	178.0	224.0	169.0	247.0	181.0	243.0	171.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
171.0	137.0	159.0	131.0	175.0	139.0	161.0	135.0
173.0	137.0	163.0	135.0	174.0	138.0	165.0	138.0
174.0	137.0	163.0	135.0	175.0	139.0	165.0	139.0
173.0	137.0	164.0	135.0	174.0	138.0	166.0	138.0
175.0	139.0	165.0	136.0	177.0	139.0	168.0	139.0
177.0	139.0	167.0	138.0	179.0	141.0	171.0	141.0
177.0	138.0	167.0	137.0	179.0	141.0	169.0	141.0
178.0	139.0	169.0	139.0	181.0	142.0	171.0	142.0

RESULTS FROM THE SECOND RUN
 THIS RUN STARTED OCTOBER 27, 1976
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 36,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : NONE
 C. SILICA : NONE
 D. CARBONATE: NONE
 E. PH : UNKNOWN
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER : NO INSULATION ON THE MINI EXCHANGERS

FLOURATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
3200.1	162.6	156.2	156.2	168.5	.00	109.8	106.8	76.1	90.8	95.9	.00
3348.9	162.9	162.4	163.0	163.7	1.33	110.2	111.3	81.6	86.7	97.4	1.33
3348.9	163.1	162.7	163.6	163.6	2.58	108.6	112.5	82.4	87.1	97.6	2.58
3275.8	162.9	162.6	163.7	165.4	4.33	105.6	104.0	77.9	83.3	92.7	4.33
3275.8	167.0	166.1	166.1	168.5	9.83	107.2	107.2	78.3	84.1	94.2	9.83
3203.9	171.0	169.9	172.2	173.4	20.83	100.1	101.3	72.1	77.2	87.7	20.83
3205.2	169.9	168.9	171.0	172.6	25.17	101.8	100.4	72.4	77.7	88.1	25.17
3272.3	171.1	170.9	172.5	174.1	27.33	95.2	95.1	69.1	74.2	83.4	27.33

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
58.9	74.6	73.5	76.8	76.0	.00	69.0	60.9	67.9	58.5	64.1	.00
58.8	74.6	80.3	92.0	76.4	1.33	72.7	60.3	71.9	56.7	65.4	1.33
61.3	77.3	82.9	96.5	79.5	2.58	67.7	54.9	64.9	49.3	59.2	2.58
60.4	75.9	82.8	93.5	78.2	4.33	64.2	54.8	63.8	52.2	58.7	4.33
59.9	75.7	79.9	92.3	77.0	9.83	62.4	53.4	64.9	52.5	58.4	9.83
57.6	71.3	78.9	88.5	74.1	20.83	67.6	54.1	66.6	54.9	60.8	20.83
53.1	67.7	73.7	85.8	70.1	25.17	68.1	54.9	65.0	50.6	59.7	25.17
60.8	75.6	80.9	94.1	77.8	27.33	67.7	54.3	66.2	52.0	60.1	27.33

THIS IS THE INPUT DATA FOR THE SECOND RUN

THIS RUN STARTED OCTOBER 27, 1974

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 36,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : NONE
- D. CARBONATE: NONE
- E. PH : UNKNOWN
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : NO INSULATION ON THE MINI EXCHANGERS

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GAGE
.000	336.5	121.0	5.1	65.5	87.5	6.0
1.333	339.5	121.0	5.0	65.0	87.0	6.0
2.583	340.0	121.0	5.0	65.0	86.5	6.0
4.333	338.0	121.0	5.0	64.0	86.0	6.0
9.833	336.5	104.0	5.0	62.5	85.0	6.0
20.833	333.0	94.0	5.0	59.5	82.5	6.0
25.167	334.0	88.0	4.9	57.0	80.5	6.0
27.333	333.5	89.5	4.9	57.0	81.5	6.0

RESULTS FROM THE MAIN EXCHANGER FOR THE SECOND RUN

THIS RUN STARTED OCTOBER 27, 1974

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 36,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : NONE
- D. CARBONATE: NONE
- E. PH : UNKNOWN
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : NO INSULATION ON THE MINI EXCHANGERS

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQFT DEG F	RUN TIME HOURS
471.6	4475.5	98093.0	98264.3	77.8	.00
481.7	4476.0	98141.4	98274.0	76.8	1.33
481.6	4476.4	98347.8	96050.1	75.4	2.58
462.0	4476.9	96777.6	98293.7	75.5	4.33
462.4	4477.7	103445.1	100547.7	98.9	9.83
463.2	4480.0	106433.1	102936.3	120.3	20.83
458.3	4466.8	108571.7	104845.1	138.2	25.17
458.4	4480.9	107721.9	107671.4	138.7	27.33

THIS IS THE INPUT DATA FOR THE THIRD RUN

THIS RUN STARTED DECEMBER 9, 1974

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : 350 PPM
- D. CARBONATE: 700 PPM
- E. PH : 8.1
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.4	7.4	7.4	7.4	14.	71.0	83.0	66.0	71.0	63.0	66.
1.33	7.6	7.6	7.6	7.6	13.	73.0	85.0	67.0	73.0	64.0	67.
2.60	7.4	7.4	7.4	7.4	13.	74.0	85.0	69.0	74.0	65.0	69.
4.42	7.4	7.5	7.5	7.5	8.	74.0	85.0	69.0	74.0	65.0	69.
5.08	7.5	7.5	7.6	7.6	8.	73.0	84.0	67.0	73.0	63.0	67.
13.52	7.6	7.6	7.6	7.6	8.	70.0	81.0	64.0	70.0	59.0	64.
14.60	7.4	7.4	7.6	7.5	8.	70.0	80.0	64.0	70.0	59.0	64.
15.35	7.5	7.5	7.6	7.6	8.	71.0	81.0	64.0	71.0	59.0	64.
21.35	7.6	7.6	7.6	7.7	8.	71.0	81.0	65.0	71.0	61.0	65.
22.52	7.7	7.8	7.7	7.8	8.	73.0	83.0	67.0	73.0	63.0	67.
24.03	7.6	7.7	7.8	7.8	8.	75.0	83.0	68.0	75.0	64.0	68.
25.30	7.6	7.7	7.7	7.8	8.	76.0	85.0	69.0	76.0	66.0	69.
27.57	7.7	8.0	8.1	8.1	8.	77.0	85.0	69.0	77.0	65.0	69.
28.48	7.7	7.8	7.9	7.8	9.	75.0	84.0	68.0	75.0	65.0	68.
29.40	7.7	7.7	7.8	7.8	8.	74.0	83.0	67.0	74.0	63.0	67.
33.52	7.7	7.7	7.8	7.9	8.	73.0	82.0	67.0	73.0	63.0	67.
34.52	7.7	7.7	7.8	7.8	8.	73.0	82.0	67.0	73.0	62.0	67.
49.48	7.5	7.5	7.5	7.6	8.	67.0	75.0	61.0	67.0	57.0	61.
50.35	7.7	7.7	7.8	7.7	8.	65.0	72.0	59.0	65.0	56.0	59.
51.67	7.7	7.8	7.9	7.8	8.	69.0	73.0	61.0	69.0	56.0	61.
52.55	7.5	7.5	7.6	7.5	8.	67.0	74.0	61.0	67.0	57.0	61.

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
331.0	232.0	331.0	224.0	331.0	246.0	331.0	245.0	232.0	175.0	224.0	171.0	246.0	184.0	245.0	178.0
332.0	227.0	332.0	227.0	332.0	259.0	332.0	248.0	227.0	178.0	227.0	175.0	259.0	189.0	248.0	183.0
334.0	230.0	333.0	231.0	333.0	252.0	333.0	250.0	230.0	181.0	231.0	178.0	252.0	192.0	250.0	186.0
333.0	231.0	332.0	232.0	333.0	253.0	333.0	251.0	231.0	182.0	232.0	180.0	253.0	193.0	251.0	186.0
354.0	233.0	333.0	233.0	333.0	254.0	333.0	252.0	233.0	183.0	233.0	180.0	254.0	193.0	252.0	187.0
334.0	239.0	333.0	240.0	333.0	260.0	333.0	257.0	239.0	187.0	240.0	185.0	260.0	199.0	257.0	194.0
334.0	240.0	339.0	241.0	334.0	261.0	334.0	258.0	240.0	188.0	241.0	186.0	261.0	199.0	258.0	185.0
334.0	241.0	334.0	242.0	334.0	262.0	334.0	259.0	241.0	189.0	242.0	186.0	262.0	201.0	259.0	195.0
335.0	245.0	334.0	245.0	334.0	266.0	334.0	264.0	245.0	191.0	245.0	189.0	266.0	204.0	264.0	200.0
335.0	246.0	334.0	247.0	334.0	267.0	334.0	264.0	246.0	193.0	247.0	190.0	267.0	205.0	264.0	202.0
334.0	247.0	333.0	248.0	333.0	267.0	333.0	265.0	247.0	194.0	248.0	192.0	267.0	206.0	265.0	203.0
335.0	249.0	334.0	249.0	334.0	268.0	334.0	265.0	249.0	195.0	249.0	193.0	268.0	207.0	265.0	205.0
335.0	250.0	334.0	250.0	335.0	269.0	335.0	257.0	250.0	197.0	250.0	195.0	269.0	208.0	257.0	206.0
335.0	251.0	334.0	251.0	334.0	269.0	335.0	267.0	251.0	198.0	251.0	196.0	269.0	209.0	267.0	206.0
336.0	251.0	335.0	251.0	335.0	270.0	335.0	268.0	251.0	198.0	251.0	197.0	270.0	210.0	268.0	208.0
335.0	251.0	333.0	253.0	333.0	269.0	334.0	267.0	251.0	196.0	253.0	195.0	269.0	209.0	267.0	206.0
335.0	257.0	335.0	255.0	335.0	271.0	335.0	269.0	257.0	200.0	255.0	199.0	271.0	211.0	269.0	210.0
335.0	263.0	333.0	264.0	333.0	275.0	333.0	273.0	263.0	215.0	264.0	215.0	275.0	225.0	273.0	223.0
326.0	255.0	322.0	255.0	326.0	268.0	322.0	264.0	255.0	207.0	255.0	206.0	268.0	217.0	264.0	217.0
331.0	262.0	331.0	263.0	332.0	273.0	332.0	271.0	262.0	215.0	263.0	215.0	273.0	224.0	271.0	223.0
330.0	263.0	329.0	264.0	329.0	273.0	329.0	270.0	263.0	215.0	264.0	215.0	273.0	225.0	270.0	224.0
EXCHANGER NUMBER 3 TEMPS IN DEG. F															
IN	OUT	IN	OUT	IN	OUT	IN	OUT								
175.0	139.0	171.0	140.0	184.0	145.0	178.0	145.0								
178.0	143.0	175.0	143.0	189.0	149.0	183.0	149.0								
181.0	145.0	178.0	145.0	192.0	151.0	186.0	151.0								
182.0	145.0	180.0	145.0	193.0	152.0	186.0	152.0								
183.0	145.0	180.0	146.0	193.0	152.0	187.0	153.0								
187.0	149.0	185.0	149.0	199.0	157.0	194.0	156.0								
188.0	148.0	186.0	150.0	199.0	157.0	185.0	157.0								
189.0	149.0	186.0	151.0	201.0	158.0	195.0	158.0								
191.0	151.0	189.0	153.0	204.0	161.0	200.0	161.0								
193.0	153.0	190.0	154.0	205.0	163.0	202.0	162.0								
194.0	154.0	192.0	155.0	206.0	165.0	203.0	164.0								
195.0	155.0	193.0	157.0	207.0	165.0	205.0	165.0								
197.0	156.0	195.0	159.0	208.0	167.0	206.0	167.0								
198.0	157.0	196.0	158.0	209.0	166.0	206.0	166.0								
198.0	156.0	197.0	159.0	210.0	167.0	208.0	167.0								
196.0	155.0	195.0	157.0	209.0	165.0	206.0	165.0								
200.0	156.0	199.0	158.0	211.0	168.0	210.0	167.0								
215.0	165.0	215.0	171.0	225.0	181.0	223.0	181.0								
207.0	163.0	206.0	165.0	217.0	176.0	217.0	177.0								
215.0	167.0	215.0	171.0	224.0	181.0	223.0	181.0								
215.0	170.0	215.0	173.0	225.0	183.0	224.0	183.0								

RESULTS FROM THE THIRD RUN
THIS RUN STARTED DECEMBER 9, 1976
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 350 PPM
D. CARBONATE: 700 PPM
E. PH : 8.1
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS											
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	DEG. F	HOURS
10123.7	171.5	171.5	171.5	171.5	.00	133.0	147.3	109.8	111.4	125.4	.00
9597.3	174.9	174.9	174.9	174.9	1.33	142.9	142.9	90.8	107.6	121.1	1.33
9746.6	170.8	171.6	171.8	171.8	2.60	131.6	129.5	97.1	100.0	114.5	2.60
5970.3	172.3	173.3	173.7	173.7	4.42	98.6	97.1	73.2	75.5	86.1	4.42
5971.5	171.5	174.1	175.1	174.8	5.08	107.8	94.2	70.6	72.7	86.3	5.08
6012.4	175.9	177.2	176.0	177.2	13.52	92.6	91.2	67.5	71.3	80.6	13.52
5976.3	171.3	172.0	174.8	173.6	14.60	84.6	87.5	63.5	66.1	75.4	14.60
5975.1	173.6	173.6	175.9	177.1	15.35	85.6	84.5	63.6	67.2	75.2	15.35
6124.5	175.8	175.9	175.9	178.2	21.35	85.6	84.8	61.4	64.4	74.0	21.35
6010.0	178.1	179.4	178.2	179.4	22.52	85.4	84.0	61.1	64.7	73.8	22.52
6010.0	177.1	178.3	179.5	180.6	24.03	75.4	74.2	55.2	57.5	65.6	24.03
6030.0	176.8	178.2	179.2	180.5	25.30	79.0	78.9	58.6	62.2	69.7	25.30
6007.6	178.1	185.2	187.4	187.4	27.57	72.3	74.4	56.2	68.5	67.9	27.57
6703.0	178.1	179.4	181.7	180.5	28.48	81.8	81.6	61.8	64.4	72.4	28.48
6010.0	178.3	178.8	179.3	181.1	29.40	77.9	77.2	57.1	59.8	68.0	29.40
6063.5	178.1	178.8	180.6	181.7	33.52	77.6	74.1	57.5	60.8	67.5	33.52
6063.5	178.1	179.1	180.5	180.5	34.52	71.9	74.5	57.7	59.8	66.0	34.52
6094.4	173.5	173.7	173.7	174.8	49.48	62.6	60.1	49.2	51.5	55.9	49.48
6113.0	178.9	179.3	180.1	179.3	50.35	60.3	57.9	48.5	49.1	54.1	50.35
6111.8	178.5	179.6	183.0	180.7	51.67	45.6	45.1	38.9	39.9	42.4	51.67
6110.6	173.9	174.0	176.3	174.0	52.55	56.3	54.6	46.7	48.8	51.6	52.55

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	SQ.FT.	DEG. F		HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS
88.8	86.3	89.1	99.0	90.8	.00	82.9	72.3	83.1	72.2	77.6	.00
84.7	91.1	105.1	103.1	96.0	1.33	76.1	70.5	80.0	69.8	74.1	1.33
77.0	84.5	84.8	93.2	84.9	2.60	89.9	83.9	94.8	83.0	87.9	2.60
60.0	64.4	66.3	74.2	66.2	4.42	69.7	67.0	71.3	60.9	67.2	4.42
64.3	70.1	72.3	79.3	71.5	5.08	69.3	63.5	70.4	59.5	65.7	5.08
64.4	68.9	68.1	72.6	68.5	13.52	72.0	69.3	72.9	68.0	70.5	13.52
61.3	65.4	67.5	83.8	69.5	14.60	76.7	69.1	75.1	52.5	68.4	14.60
67.6	73.5	72.5	78.9	73.1	15.35	74.0	64.9	73.5	65.1	69.4	15.35
65.0	67.9	67.2	71.6	67.9	21.35	66.5	59.8	64.7	60.4	62.8	21.35
64.1	70.0	67.7	69.4	67.8	22.52	66.4	60.6	63.3	61.7	63.0	22.52
69.2	74.0	73.1	76.0	73.1	24.03	66.2	61.8	62.1	60.4	62.7	24.03
70.5	74.3	73.3	73.7	73.0	25.30	58.5	53.0	56.5	54.7	55.7	25.30
74.9	81.4	82.6	71.8	77.7	27.57	66.4	60.1	63.4	60.8	62.7	27.57
72.1	75.9	76.2	78.1	75.6	28.48	60.4	56.5	59.2	55.3	57.8	28.48
68.1	69.8	70.6	72.1	70.2	29.40	66.2	59.3	61.7	59.8	61.7	29.40
64.9	68.6	65.3	67.8	66.6	33.52	65.5	60.5	64.6	61.2	63.0	33.52
65.5	65.3	64.8	64.2	64.9	34.52	74.9	69.7	67.2	67.7	69.9	34.52
53.5	54.5	52.6	53.5	53.5	49.48	64.1	55.1	51.2	49.5	55.0	49.48
56.6	58.0	56.8	52.6	56.0	50.35	54.1	50.2	46.4	44.9	48.9	50.35
63.5	65.1	64.3	62.7	63.9	51.67	69.0	62.5	58.1	56.2	61.5	51.67
54.5	55.5	52.3	50.0	53.0	52.55	58.1	53.6	50.5	48.8	52.7	52.55

THIS IS THE INPUT DATA FOR THE THIRD RUN

THIS RUN STARTED DECEMBER 9, 1974

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : 350 PPM
- D. CARBONATE: 700 PPM
- E. PH : 8.1
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLW20	COOLW20	COOLW20
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GAGE
.000	342.5	92.0	5.0	62.5	80.0	6.4
1.333	342.5	93.5	5.0	64.5	82.0	6.2
2.600	343.5	94.0	5.0	65.0	82.5	6.2
4.417	343.0	94.0	4.9	65.0	82.0	6.2
5.083	343.0	93.5	4.9	63.0	81.0	6.2
13.517	344.0	90.0	5.0	59.5	77.0	6.2
14.600	344.0	90.0	5.0	59.5	77.0	6.1
15.350	343.0	90.5	5.0	59.5	77.5	6.1
21.350	344.0	93.0	5.0	61.0	79.0	5.8
22.517	344.0	94.0	5.0	62.0	80.0	5.6
24.033	343.0	95.5	4.9	64.0	81.5	5.7
25.300	344.0	96.5	4.9	66.0	83.0	5.7
27.567	344.5	97.5	4.9	66.0	83.0	5.6
28.483	344.0	97.0	4.9	64.5	82.5	5.5
29.400	344.5	97.0	5.0	64.0	81.5	5.6
33.517	343.0	96.0	5.0	63.0	80.5	5.6
34.517	344.0	97.0	4.9	62.5	80.0	5.6
49.483	346.0	102.0	4.9	57.5	75.0	5.7
50.350	337.5	102.0	4.9	56.0	72.5	5.7
51.667	342.5	102.0	4.7	56.0	73.0	5.7
52.550	341.5	104.0	5.0	57.0	74.5	5.7

RESULTS FROM THE MAIN EXCHANGER FOR THE THIRD RUN
THIS RUN STARTED DECEMBER 9, 1976
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 350 PPM
D. CARBONATE: 700 PPM
E. PH : 8.1
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQFT DEG F	RUN TIME HOURS
461.0	4766.1	111301.9	83322.9	133.5	.00
462.9	4629.8	111088.4	80858.8	134.1	1.33
459.0	4629.3	110381.2	80850.8	133.5	2.60
447.1	4607.4	107307.1	78168.4	127.7	4.42
456.3	4608.3	109736.0	82866.1	130.6	5.08
460.7	4612.0	112771.0	80628.4	127.8	13.52
460.7	4559.6	112771.0	79713.7	127.2	14.60
460.9	4559.2	112156.1	81983.0	128.8	15.35
460.7	4333.7	111460.1	77927.8	122.8	21.35
460.7	4220.7	111023.1	75897.3	121.5	22.52
456.3	4256.8	108870.1	74345.3	119.9	24.03
456.1	4255.6	108830.8	72199.6	120.0	25.30
446.8	4180.9	106400.9	70932.9	114.7	27.57
451.5	4091.7	107517.3	73503.4	117.1	28.48
462.4	4167.2	110349.9	72780.1	115.4	29.40
460.9	4183.0	109751.1	73128.8	115.4	33.52
451.5	4183.4	107517.3	73136.1	110.1	34.52
451.0	4262.3	106154.6	74516.1	92.2	49.48
452.9	4264.5	102826.4	70293.1	86.7	50.35
433.4	4244.0	100510.4	72415.9	86.3	51.67
461.2	4262.8	105650.3	74523.6	89.8	52.55

THIS IS THE INPUT DATA FOR THE FOURTH RUN
THIS RUN STARTED DECEMBER 14, 1976
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 500 PPM
D. CARBONATE: 1000 PPM
E. PH : 8.7
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.4	7.4	7.5	7.4	8.	63.0	72.0	56.0	63.0	53.0	56.0
2.83	7.4	7.3	7.3	7.4	8.	63.0	73.0	57.0	63.0	53.0	57.0
4.27	7.4	7.3	7.3	7.4	9.	65.0	74.0	58.0	65.0	54.0	58.0
5.58	7.3	7.2	7.2	7.3	8.	65.0	74.0	59.0	65.0	55.0	59.0
6.58	7.4	7.3	7.2	7.3	8.	69.0	74.0	59.0	69.0	55.0	59.0
15.53	7.2	7.1	7.1	7.2	8.	63.0	71.0	58.0	63.0	54.0	58.0
23.18	7.6	7.5	7.7	7.6	8.	63.0	69.0	58.0	63.0	54.0	58.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
332.0	231.0	330.0	231.0	331.0	244.0	331.0	236.0	231.0	173.0	231.0	170.0	244.0	177.0	236.0	174.0
331.0	241.0	330.0	239.0	331.0	249.0	330.0	244.0	241.0	182.0	239.0	179.0	249.0	185.0	244.0	183.0
331.0	245.0	329.0	244.0	329.0	251.0	329.0	248.0	245.0	187.0	244.0	187.0	251.0	190.0	248.0	189.0
329.0	248.0	328.0	247.0	329.0	253.0	329.0	251.0	248.0	191.0	247.0	189.0	253.0	194.0	251.0	193.0
331.0	251.0	331.0	251.0	331.0	255.0	331.0	255.0	251.0	195.0	251.0	193.0	255.0	198.0	255.0	197.0
329.0	261.0	329.0	261.0	329.0	262.0	329.0	262.0	261.0	210.0	261.0	210.0	262.0	212.0	262.0	213.0
332.0	272.0	332.0	272.0	332.0	276.0	331.0	276.0	272.0	229.0	272.0	229.0	276.0	231.0	276.0	232.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
173.0	137.0	170.0	132.0	177.0	136.0	174.0	136.0
182.0	140.0	179.0	140.0	185.0	142.0	183.0	143.0
187.0	143.0	187.0	143.0	190.0	145.0	189.0	146.0
191.0	145.0	189.0	145.0	194.0	148.0	193.0	149.0
195.0	149.0	193.0	149.0	198.0	151.0	197.0	153.0
210.0	165.0	210.0	165.0	212.0	166.0	213.0	169.0
229.0	189.0	229.0	190.0	231.0	191.0	232.0	193.0

RESULTS FROM THE FOURTH RUN
THIS RUN STARTED DECEMBER 14, 1976
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 500 PPM
D. CARBONATE: 1000 PPM
E. PH : 8.7
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

FLOWRATES						MINI EXCHANGER NUMBER 1					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	OVERALL HEAT TRANSFER COEFFICIENTS					
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
							BTU/HR. SQ.FT. DEG. F				HOURS
6135.4	174.9	171.6	173.9	171.5	.00	83.9	81.0	69.5	76.5	77.8	.00
6022.0	172.7	169.3	169.2	170.5	2.83	79.2	79.1	69.3	74.3	75.4	2.83
6693.9	171.5	169.4	168.2	170.5	4.27	77.2	75.8	67.9	72.0	73.2	4.27
6043.2	169.8	168.1	167.1	168.2	5.58	69.9	69.5	63.7	66.2	67.3	5.58
6110.6	170.4	168.1	166.9	168.1	6.58	53.9	53.1	49.6	50.0	51.6	6.58
6099.2	167.1	165.9	163.6	167.1	15.53	57.0	56.6	54.9	56.1	56.2	15.53
5989.4	176.1	173.8	178.4	176.2	23.18	46.1	45.5	43.2	41.9	44.2	23.18

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
					HOURS						HOURS
	BTU/HR. SQ.FT. DEG. F						BTU/HR. SQ.FT. DEG. F				
78.1	81.6	84.9	80.3	81.2	.00	57.6	62.3	64.5	59.7	61.0	.00
68.7	69.7	70.6	69.3	69.6	2.83	69.4	64.0	68.1	63.9	66.4	2.83
76.6	74.5	76.9	76.3	76.1	4.27	71.6	70.7	70.2	67.9	70.1	4.27
64.7	65.8	64.3	64.2	64.7	5.58	69.0	65.9	66.1	63.6	66.1	5.58
85.1	87.5	83.0	85.4	85.2	6.58	66.9	63.6	65.6	61.5	64.4	6.58
50.7	50.3	48.2	48.1	49.3	15.53	56.4	56.1	55.9	53.7	55.5	15.53
42.7	42.1	44.6	42.9	43.1	23.18	46.4	44.5	46.4	44.3	45.4	23.18

THIS IS THE INPUT DATA FOR THE FOURTH RUN
THIS RUN STARTED DECEMBER 14, 1976
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 500 PPM
D. CARBONATE: 1000 PPM
E. PH : 8.7
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GAGE
.000	344.0	86.0	5.0	53.0	69.0	6.5
2.833	343.0	91.5	5.1	53.0	70.0	6.3
4.267	342.5	95.0	5.1	54.0	71.0	6.1
5.583	342.0	96.0	5.1	55.0	71.0	6.3
6.583	343.0	98.0	5.1	54.5	71.0	6.4
15.533	341.0	103.0	5.1	54.0	70.0	6.3
23.183	343.5	114.5	5.1	54.5	70.0	6.3

RESULTS FROM THE MAIN EXCHANGER FOR THE FOURTH RUN
THIS RUN STARTED DECEMBER 14, 1976
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : 500 PPM
D. CARBONATE: 1000 PPM
E. PH : 8.7
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

BRINE	COOLH2O	BRINE	COOLH2O	OVERALL	RUN
FLOW	FLOW	FLUX	FLUX	HTC	TIME
LB/HR	LB/HR	BTU/HR	BTU/HR	BTU/HR SQ.FT. DEG.F	HOURS
460.7	4866.4	114518.0	77861.7	114.1	.00
465.5	4678.3	112836.1	79450.8	105.8	2.83
465.6	4565.1	111089.6	77528.6	100.2	4.27
468.5	4714.7	111102.8	75360.5	97.8	5.58
465.5	4789.6	109964.9	78949.1	96.1	6.58
466.0	4715.7	106947.3	75375.4	86.4	15.53
470.0	4678.3	103887.1	72440.4	74.3	23.18

THIS IS THE INPUT DATA FOR THE FIFTH RUN
THIS RUN STARTED DECEMBER 21, 1976
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 43,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 7-8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1		EXCH 2		EXCH 3	
						IN	OUT	IN	OUT	IN	OUT
.00	7.3	7.7	7.4	7.3	26631.	65.0	79.0	57.0	65.0	53.0	57.0
16.08	7.5	7.4	7.7	7.6	36163.	65.0	79.0	57.0	65.0	54.0	57.0
18.20	7.3	7.2	7.4	7.3	47038.	66.0	80.0	59.0	66.0	54.0	59.0
21.28	7.3	7.3	7.6	7.3	38988.	66.0	81.0	60.0	66.0	55.0	60.0
23.00	7.4	7.4	7.6	7.4	40412.	67.0	81.0	60.0	67.0	56.0	60.0
24.13	7.4	7.3	7.6	7.4	41147.	67.0	81.0	60.0	67.0	56.0	60.0
40.08	7.3	7.3	7.4	7.4	51018.	64.0	78.0	57.0	64.0	53.0	57.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
330.0	215.0	329.0	229.0	329.0	225.0	329.0	238.0
333.0	223.0	331.0	240.0	331.0	237.0	332.0	244.0
332.0	226.0	331.0	241.0	331.0	237.0	331.0	245.0
332.0	225.0	331.0	240.0	331.0	235.0	331.0	244.0
331.0	225.0	331.0	240.0	330.0	239.0	331.0	244.0
333.0	227.0	333.0	241.0	332.0	238.0	333.0	245.0
331.0	227.0	329.0	243.0	329.0	234.0	329.0	247.0

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
215.0	171.0	229.0	161.0	225.0	167.0	238.0	163.0
223.0	180.0	240.0	168.0	237.0	176.0	244.0	172.0
226.0	181.0	241.0	171.0	237.0	179.0	245.0	172.0
225.0	181.0	240.0	169.0	235.0	178.0	244.0	172.0
225.0	182.0	240.0	170.0	239.0	170.0	244.0	172.0
227.0	183.0	241.0	172.0	238.0	181.0	245.0	173.0
227.0	186.0	243.0	175.0	234.0	182.0	247.0	178.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
171.0	129.0	161.0	129.0	167.0	130.0	163.0	131.0
180.0	138.0	168.0	138.0	176.0	138.0	172.0	139.0
181.0	139.0	171.0	139.0	179.0	139.0	172.0	139.0
181.0	139.0	169.0	138.0	178.0	139.0	172.0	139.0
182.0	139.0	170.0	139.0	170.0	140.0	172.0	141.0
183.0	141.0	172.0	141.0	181.0	141.0	173.0	141.0
186.0	142.0	175.0	141.0	182.0	141.0	178.0	143.0

RESULTS FROM THE FIFTH RUN
THIS RUN STARTED DECEMBER 21, 1976
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 43,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 7-8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
4920.4	168.1	179.1	171.7	168.9	.00	107.0	95.2	96.0	79.6	94.4	.00
3431.4	173.7	172.7	178.5	174.9	16.08	88.9	69.9	75.2	67.6	75.4	16.08
5250.0	168.0	166.9	172.7	168.1	18.20	104.0	84.2	92.0	80.1	90.1	18.20
6882.6	169.1	169.2	175.0	169.2	21.28	127.7	104.2	115.3	98.6	111.5	21.28
5383.6	171.1	171.1	177.4	172.7	23.00	107.2	88.1	91.8	84.1	92.8	23.00
5135.8	170.2	169.1	177.2	172.5	24.13	102.5	84.9	91.9	82.0	90.3	24.13
5052.1	168.8	168.2	170.5	171.7	40.08	100.4	79.4	91.2	76.5	86.8	40.08

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	
	BTU/HR. SQ.FT. DEG. F				
59.0	97.1	78.3	97.4	83.0	.00
47.1	78.3	66.9	77.0	67.3	16.08
55.0	84.6	71.0	87.4	74.5	18.20
57.6	93.4	75.8	92.4	79.8	21.28
53.0	86.6	88.8	88.1	79.2	23.00
53.6	83.7	70.5	87.7	73.9	24.13
49.0	80.7	62.5	81.7	68.5	40.08

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	
	BTU/HR. SQ.FT. DEG. F				
73.2	62.3	66.7	57.5	64.9	.00
53.9	40.4	51.0	43.9	47.3	16.08
76.6	60.6	75.7	62.7	68.9	18.20
90.8	71.2	88.4	74.3	81.2	21.28
75.4	57.4	57.2	56.7	61.7	23.00
68.3	52.5	68.3	55.1	61.0	24.13
65.8	53.4	63.3	54.7	59.3	40.08

THIS IS THE INPUT DATA FOR THE FIFTH RUN
THIS RUN STARTED DECEMBER 21, 1976
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 43,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 7-8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	339.5	95.0	5.1	53.5	70.0	30065.
16.003	342.5	97.0	4.9	54.0	71.0	42746.
18.200	342.0	97.0	5.1	54.5	71.0	43737.
21.283	342.0	98.0	5.0	55.5	72.0	46224.
23.000	341.0	99.0	4.9	56.5	72.5	48068.
24.133	342.5	100.0	5.1	56.5	72.5	48986.
40.003	340.0	100.0	5.0	53.0	69.5	61473.

RESULTS FROM THE MAIN EXCHANGER FOR THE FIFTH RUN
THIS RUN STARTED DECEMBER 21, 1976
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 43,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 7-8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR/FT ² /DEG F	RUN TIME HOURS
469.1	4557.7	110535.4	108093.0	115.0	.00
451.8	3892.5	106932.3	46106.1	89.4	16.00
470.4	4707.7	111093.8	110567.1	114.6	18.20
459.3	8928.5	108043.9	147173.6	132.3	21.28
456.7	4735.4	106564.5	107657.8	110.7	23.00
465.6	4612.2	108079.7	105689.0	109.0	24.13
461.6	4559.1	106803.3	108116.3	105.0	40.00

THIS IS THE INPUT DATA FOR THE SIXTH RUN
THIS RUN STARTED FEBRUARY 10, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 28,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 58 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 6.0
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1		EXCH 2		EXCH 3	
.00	7.8	8.2	7.8	8.2	282289.	71.0	85.0	62.0	71.0	57.0	62.0
1.22	7.8	8.3	8.2	7.8	282920.	70.0	83.0	62.0	70.0	57.0	62.0
4.32	7.8	8.3	7.8	8.3	284470.	72.0	86.0	64.0	72.0	58.0	63.0
11.63	8.0	8.4	8.1	8.6	288580.	74.0	86.0	65.0	74.0	59.0	65.0
20.45	8.0	8.0	8.1	8.3	296091.	70.0	79.0	64.0	70.0	61.0	64.0
22.93	8.2	8.8	8.3	8.4	298138.	74.0	82.0	69.0	74.0	65.0	69.0
24.15	8.3	8.8	8.4	8.4	299372.	78.0	86.0	73.0	78.0	69.0	73.0
27.98	8.1	8.8	8.2	8.3	302276.	75.0	83.0	70.0	75.0	66.0	70.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
332.0	242.0	333.0	256.0	334.0	250.0	334.0	256.0	242.0	195.0	256.0	196.0	250.0	202.0		
336.0	242.0	334.0	256.0	334.0	251.0	335.0	256.0	242.0	195.0	256.0	196.0	251.0	202.0		
334.0	245.0	335.0	255.0	336.0	255.0	336.0	257.0	245.0	198.0	255.0	199.0	255.0	205.0		
334.0	254.0	335.0	263.0	336.0	263.0	337.0	263.0	254.0	203.0	263.0	205.0	263.0	213.0		
332.0	249.0	333.0	259.0	334.0	260.0	334.0	259.0	249.0	195.0	259.0	199.0	260.0	207.0		
331.0	256.0	333.0	264.0	333.0	264.0	333.0	264.0	256.0	201.0	264.0	204.0	264.0	210.0		
332.0	261.0	334.0	270.0	335.0	269.0	335.0	269.0	261.0	207.0	270.0	212.0	269.0	218.0		
332.0	264.0	333.0	273.0	334.0	273.0	334.0	272.0	264.0	211.0	273.0	216.0	273.0	220.0		

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
195.0	153.0	196.0	158.0	202.0	144.0	194.0	157.0
195.0	156.0	196.0	160.0	202.0	163.0	195.0	158.0
198.0	158.0	199.0	164.0	205.0	168.0	200.0	162.0
203.0	162.0	205.0	169.0	213.0	174.0	205.0	166.0
195.0	154.0	199.0	161.0	207.0	167.0	198.0	159.0
201.0	159.0	204.0	165.0	210.0	170.0	203.0	164.0
207.0	163.0	212.0	171.0	218.0	175.0	210.0	169.0
211.0	166.0	216.0	173.0	220.0	178.0	213.0	172.0

RESULTS FROM THE SIXTH RUN
THIS RUN STARTED FEBRUARY 10, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 28,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 58 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 6.0
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

MINI EXCHANGER NUMBER 1											
OVERALL HEAT TRANSFER COEFFICIENTS											
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	SO.FT. DEG. F	HOURS
4299.4	180.7	189.9	180.5	189.8	.00	85.6	74.0	77.8	74.8	78.1	.00
3881.4	179.5	191.0	189.8	179.3	1.22	78.1	68.5	73.4	65.0	71.2	1.22
4770.1	180.5	192.0	180.4	191.9	4.32	88.3	82.0	77.9	80.4	82.1	4.32
7062.5	185.2	193.2	188.5	198.8	11.63	94.7	86.7	85.6	91.3	89.6	11.63
6844.2	185.4	185.3	188.6	192.1	20.45	81.2	70.4	71.4	73.9	74.2	20.45
8413.0	190.1	203.8	192.2	194.5	22.93	80.8	77.8	73.4	74.3	76.6	22.93
6281.1	192.3	203.7	193.2	195.5	24.15	68.4	63.6	62.3	63.0	64.3	24.15
5925.0	187.7	203.8	189.8	192.1	27.98	63.2	59.0	55.8	57.5	58.9	27.98

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	SO.FT. DEG. F			HOURS		BTU/HR.	SO.FT. DEG. F			HOURS
59.6	76.6	58.0	79.7	68.5	.00	63.1	58.3	52.7	57.4	57.9	.00
53.3	69.4	55.9	66.5	61.3	1.22	55.8	53.4	52.3	52.4	53.5	1.22
62.9	77.3	63.4	77.9	70.4	4.32	61.9	55.8	53.3	60.9	58.0	4.32
82.1	94.4	77.3	97.1	87.7	11.63	83.5	73.6	74.0	83.1	78.5	11.63
69.0	73.5	64.0	77.7	71.0	20.45	62.3	54.9	55.6	59.2	58.0	20.45
70.3	79.6	66.2	77.5	73.4	22.93	80.0	76.5	70.7	73.6	75.2	22.93
61.3	66.9	54.8	66.0	62.3	24.15	71.0	66.2	63.2	64.6	66.3	24.15
55.3	62.1	53.1	61.4	58.0	27.98	65.4	64.6	56.7	58.9	61.4	27.98

THIS IS THE INPUT DATA FOR THE SIXTH RUN
THIS RUN STARTED FEBRUARY 10, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 28,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 58 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 6.0
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
.000	343.0	104.0	5.0	57.0	82.0	41647.
1.217	344.0	104.0	5.1	57.0	80.0	42235.
4.316	344.0	105.0	5.1	58.0	82.0	43588.
11.633	345.0	108.0	5.1	59.5	83.0	47515.
20.450	343.0	110.0	5.1	61.0	83.5	52151.
22.933	342.5	113.0	5.1	65.0	87.0	53419.
24.150	344.0	115.0	5.1	69.0	90.0	54426.
27.983	343.0	118.0	5.1	66.0	88.5	55974.

RESULTS FROM THE MAIN EXCHANGER FOR THE SIXTH RUN
THIS RUN STARTED FEBRUARY 10, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 28,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 58 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 6.0
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
468.9	4008.8	105374.1	100119.1	111.8	.00
469.9	3623.9	108782.3	83265.9	103.8	1.22
469.9	4453.0	108335.9	106765.1	118.6	4.32
469.7	4361.8	107403.9	102398.7	112.2	11.63
470.1	4205.8	105694.1	94440.1	105.5	20.45
465.6	6919.9	103127.2	151932.3	136.8	22.93
465.3	3345.5	102850.0	70115.3	94.5	24.15
470.1	4242.5	102912.7	95265.6	101.6	27.98

THIS IS THE INPUT DATA FOR THE SEVENTH RUN

THIS RUN STARTED MARCH 2, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 34 PP
C. SILICA : 300 PPM
D. CARBONATE: 600 PPM
E. PH : 6.9
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	7.4	7.4	7.3	7.6	405182.	76.0	87.0	69.0	76.0	66.0	69.0
1.50	7.8	7.8	7.6	8.1	406157.	77.0	87.0	70.0	77.0	66.0	70.0
2.50	8.7	8.8	8.6	9.1	406809.	79.0	90.0	71.0	79.0	66.0	71.0
3.55	7.3	7.2	7.1	7.5	407465.	76.0	86.0	71.0	78.0	66.0	71.0
5.17	7.4	7.4	7.3	7.4	408458.	78.0	88.0	72.0	78.0	67.0	72.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
312.0	217.0	314.0	234.0	315.0	238.0	315.0	242.0
315.0	229.0	316.0	245.0	316.0	248.0	316.0	252.0
316.0	238.0	317.0	249.0	318.0	254.0	310.0	256.0
312.0	234.0	313.0	246.0	314.0	248.0	314.0	253.0
314.0	237.0	315.0	250.0	316.0	254.0	316.0	253.0

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
217.0	178.0	234.0	178.0	238.0	189.0	242.0	184.0
229.0	185.0	245.0	189.0	248.0	200.0	252.0	196.0
238.0	194.0	249.0	198.0	254.0	208.0	256.0	204.0
234.0	190.0	246.0	192.0	248.0	199.0	253.0	196.0
237.0	194.0	250.0	196.0	254.0	205.0	253.0	196.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
178.0	143.0	178.0	144.0	189.0	153.0	184.0	156.0
185.0	150.0	189.0	152.0	200.0	161.0	196.0	156.0
194.0	158.0	198.0	162.0	208.0	170.0	204.0	166.0
190.0	152.0	192.0	154.0	199.0	161.0	196.0	157.0
194.0	155.0	196.0	160.0	205.0	166.0	196.0	161.0

RESULTS FROM THE SEVENTH RUN

THIS RUN STARTED MARCH 2, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 34 PP
C. SILICA : 300 PPM
D. CARBONATE: 600 PPM
E. PH : 6.9
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1					AVERAGE	TIME HOURS
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4		
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.		
5387.7	174.3	171.8	169.4	176.4	.00	103.4	80.9	75.7	73.9	83.5	.00
5404.3	182.2	181.0	178.6	189.1	1.50	92.3	72.0	67.5	66.5	74.6	1.50
5175.4	203.1	204.2	200.6	213.1	2.50	93.1	78.9	71.8	65.1	77.2	2.50
5094.3	170.8	168.4	165.9	175.3	3.55	80.3	65.5	63.1	60.8	67.4	3.55
5255.3	171.8	171.7	170.4	172.8	5.17	81.2	65.9	61.6	63.6	68.1	5.17

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
	BTU/HR. SQ.FT. DEG. F						BTU/HR. SQ.FT. DEG. F				
41.5	82.2	66.8	83.0	73.4	.00	60.6	57.7	54.4	44.3	54.3	.00
65.8	77.8	62.5	77.5	70.9	1.50	62.0	63.3	60.0	67.9	63.3	1.50
70.5	78.3	65.8	79.8	73.6	2.50	68.4	66.3	63.6	69.9	67.0	2.50
51.0	59.0	51.1	62.6	55.9	3.55	68.3	66.0	60.9	68.2	65.8	3.55
54.4	65.1	56.1	68.6	61.0	5.17	70.5	62.8	63.3	61.1	64.4	5.17

THIS IS THE INPUT DATA FOR THE SEVENTH RUN

THIS RUN STARTED MARCH 2, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 34 PP

C. SILICA : 300 PPM

D. CARBONATE: 600 PPM

E. PH : 6.9

F. ADDITIVE : NONE

I. LEVEL : NONE

G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	324.0	97.0	5.0	66.0	82.0	158717.
1.500	325.0	102.0	4.7	66.0	81.5	159783.
2.500	323.0	94.0	3.8	67.0	77.0	160510.
3.550	325.0	109.0	5.1	66.0	83.0	161258.
5.166	326.0	107.0	5.1	68.0	84.0	162352.

RESULTS FROM THE MAIN EXCHANGER FOR THE SEVENTH RUN

THIS RUN STARTED MARCH 2, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 34 PP

C. SILICA : 300 PPM

D. CARBONATE: 600 PPM

E. PH : 6.9

F. ADDITIVE : NONE

I. LEVEL : NONE

G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
465.2	5896.5	101482.4	94154.6	131.9	.00
437.1	6032.6	93887.4	93317.8	112.8	1.50
353.7	5916.6	77977.4	59106.5	87.2	2.50
474.3	5615.8	98723.5	95278.3	102.8	3.55
474.0	5835.8	100839.9	93186.4	112.3	5.17

THIS IS THE INPUT DATA FOR THE EIGHTH RUN

THIS RUN STARTED MARCH 3, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS.

B. CALCIUM : 34 PPM

C. SILICA : 300 PPM

D. CARBONATE: 600 PPM

E. PH : 6.9

F. ADDITIVE : NONE

I. LEVEL : NONE

G. OTHER :

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.8	7.7	7.8	7.8	420420.	80.0	91.0	74.0	80.0	70.0	74.0
1.48	7.6	7.6	7.6	7.9	421365.	81.0	91.0	75.0	81.0	71.0	75.0
2.77	7.6	7.5	7.5	7.8	422180.	82.0	91.0	75.0	82.0	71.0	75.0
11.42	7.9	7.9	7.9	8.5	427750.	77.0	88.0	69.0	77.0	63.0	69.0
19.48	7.9	7.9	7.9	8.3	433085.	74.0	82.0	68.0	74.0	64.0	68.0
21.63	8.3	8.3	8.3	8.6	434438.	77.0	86.0	71.0	77.0	67.0	71.0
23.93	8.1	8.2	8.5	8.6	435932.	83.0	91.0	77.0	83.0	73.0	77.0
25.35	8.1	8.1	8.1	8.4	436861.	85.0	93.0	79.0	85.0	75.0	79.0
26.56	7.9	7.9	7.9	8.4	437650.	82.0	90.0	76.0	82.0	72.0	76.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F

IN	OUT	IN	OUT	IN	OUT	IN	OUT
306.0	218.0	308.0	231.0	309.0	234.0	309.0	240.0
306.0	226.0	309.0	230.0	309.0	242.0	309.0	246.0
307.0	231.0	309.0	243.0	310.0	245.0	310.0	249.0
321.0	259.0	322.0	267.0	323.0	272.0	323.0	273.0
319.0	254.0	319.0	260.0	320.0	263.0	320.0	264.0
319.0	258.0	320.0	263.0	320.0	266.0	329.0	267.0
318.0	260.0	318.0	266.0	319.0	267.0	319.0	268.0
318.0	258.0	319.0	264.0	320.0	268.0	320.0	268.0
315.0	259.0	316.0	263.0	316.0	266.0	316.0	266.0

EXCHANGER NUMBER 2 TEMPS IN DEG. F

IN	OUT	IN	OUT	IN	OUT	IN	OUT
218.0	180.0	231.0	181.0	234.0	187.0	240.0	187.0
226.0	186.0	230.0	188.0	242.0	198.0	246.0	195.0
231.0	191.0	243.0	192.0	245.0	202.0	249.0	200.0
259.0	219.0	267.0	221.0	272.0	232.0	273.0	227.0
254.0	209.0	260.0	210.0	263.0	220.0	264.0	215.0
258.0	213.0	263.0	216.0	266.0	224.0	267.0	218.0
260.0	215.0	266.0	218.0	267.0	225.0	268.0	220.0
258.0	216.0	264.0	219.0	268.0	226.0	268.0	222.0
259.0	215.0	263.0	218.0	266.0	224.0	266.0	210.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F

IN	OUT	IN	OUT	IN	OUT	IN	OUT
180.0	145.0	181.0	148.0	187.0	156.0	187.0	183.0
186.0	150.0	188.0	153.0	198.0	162.0	195.0	158.0
191.0	155.0	192.0	157.0	202.0	165.0	200.0	161.0
219.0	191.0	221.0	186.0	232.0	195.0	227.0	199.0
209.0	169.0	210.0	173.0	220.0	180.0	215.0	176.0
213.0	174.0	216.0	177.0	224.0	185.0	218.0	180.0
215.0	176.0	218.0	181.0	225.0	187.0	220.0	183.0
216.0	178.0	219.0	183.0	226.0	189.0	222.0	185.0
215.0	175.0	218.0	180.0	224.0	186.0	210.0	182.0

RESULTS FROM THE EIGHTH RUN

THIS RUN STARTED MARCH 3, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 34 PPM

C. SILICA : 300 PPM

D. CARBONATE: 600 PPM

E. PH : 6.9

F. ADDITIVE : NONE

I. LEVEL : NONE

G. OTHER :

FLOWRATES

COUL M20	TUBE1	TUBE2	TUBE3	TUBE4	TIME
LB/MK	LB/HR	LB/HR	LB/HR	LB/HR	HOURS
5288.3	183.0	180.5	181.6	182.7	.00
5232.6	179.5	178.0	178.0	183.9	1.48
5333.2	177.0	175.7	175.6	182.6	2.77
5465.4	185.2	182.8	185.0	197.8	11.42
5221.3	185.4	183.0	182.9	193.4	19.48
5385.2	193.5	193.4	193.4	199.5	21.63
5418.4	190.1	191.3	198.2	199.3	23.93
5398.4	187.8	187.7	187.6	196.9	25.35
5373.9	183.4	185.6	183.3	195.0	26.56

MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS

TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
103.0	84.8	82.1	74.6	86.1	.00
88.4	84.9	69.4	66.6	77.3	1.48
81.5	67.4	65.8	63.5	69.6	2.77
75.1	64.3	59.5	62.2	65.3	11.42
61.6	54.3	52.0	53.9	55.4	19.48
64.3	59.2	55.6	64.6	60.9	21.63
61.1	54.2	55.9	55.0	56.6	23.93
63.2	56.8	53.0	55.6	57.2	25.35
58.7	55.5	51.3	54.6	55.0	26.56

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS

TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
59.7	73.7	67.2	74.8	68.8	.00
60.5	61.6	59.6	71.3	63.3	1.48
62.4	75.7	60.9	71.9	67.7	2.77
57.2	63.1	53.1	66.1	59.9	11.42
53.6	57.6	47.6	58.1	54.2	19.48
55.7	56.9	49.1	60.1	55.5	21.63
56.4	59.0	52.1	60.7	57.0	23.93
54.5	56.8	51.2	59.7	55.6	25.35
53.2	54.0	48.4	71.9	56.9	26.56

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS

TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
82.3	74.7	65.5	7.4	57.5	.00
66.9	62.8	58.8	64.6	63.2	1.48
62.9	59.7	58.0	65.4	61.5	2.77
46.0	57.6	57.5	63.6	56.2	11.42
56.2	50.2	50.9	54.2	52.9	19.48
56.3	54.9	51.7	54.1	54.2	21.63
57.9	53.5	54.1	54.8	55.1	23.93
57.0	52.2	50.9	55.2	53.8	25.35
59.3	55.1	51.9	43.5	52.5	26.56

THIS IS THE INPUT DATA FOR THE EIGHTH RUN
 THIS RUN STARTED MARCH 3, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 34 PPM
 C. SILICA : 300 PPM
 D. CARBONATE: 600 PPM
 E. PH : 6.9
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLW20 INLET TEMP	COOLW20 OUTLET TEMP	COOLW20 FLOWRATE GALLONS
.000	318.0	105.0	5.1	70.0	86.0	175567.
1.480	319.0	108.0	5.1	72.0	86.0	176577.
2.770	318.0	111.0	5.1	71.0	87.0	177443.
11.420	316.0	83.0	4.9	63.0	79.5	183372.
19.480	327.0	117.0	5.1	64.0	79.0	189057.
21.630	326.0	118.0	5.1	67.0	82.0	190495.
23.930	326.0	124.0	5.1	73.0	87.0	192673.
25.350	326.0	126.0	5.1	75.0	89.0	193047.
26.560	323.0	126.0	4.9	72.0	86.0	193898.

RESULTS FROM THE MAIN EXCHANGER FOR THE EIGHTH RUN
 THIS RUN STARTED MARCH 3, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 26,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 34 PPM
 C. SILICA : 300 PPM
 D. CARBONATE: 600 PPM
 E. PH : 6.9
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER :

BRINE FLOW LB/HR	COOLW20 FLOW LB/HR	BRINE FLUX BTU/HR	COOLW20 FLUX BTU/HR	OVERALL HTC BTU/HR-SQFT-DEG F	RUN TIME HOURS
475.9	5657.7	97613.6	90341.9	90.0	.00
480.3	5565.5	97622.6	77761.6	79.5	1.48
480.5	5681.4	95830.2	90721.1	82.5	2.77
453.0	5855.1	101488.9	94513.1	155.4	11.42
478.4	5552.7	96889.5	83206.9	64.2	19.48
474.0	5692.5	95080.9	85217.3	66.2	21.63
469.4	5685.4	91467.5	79435.9	63.0	23.93
474.0	5827.3	91470.1	81418.8	64.0	25.35
460.7	5721.9	87558.3	79945.7	60.2	26.56

THIS IS THE INPUT DATA FOR THE NINTH RUN
 THIS RUN STARTED MARCH 9, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 45,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 24 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 7.1
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3	
.00	7.6	7.7	7.7	7.7	439400.	IN	OUT	IN	OUT	IN	OUT
1.45	7.5	7.7	7.7	7.9	440544.	75.0	86.0	69.0	75.0	67.0	69.0
3.25	7.8	8.0	8.3	8.3	441733.	75.0	88.0	69.0	75.0	66.0	69.0
4.73	7.7	7.7	7.7	8.2	442675.	77.0	90.0	71.0	77.0	68.0	71.0
6.50	8.1	8.1	8.1	8.0	443841.	77.0	89.0	70.0	77.0	67.0	70.0
12.88	8.3	8.5	8.5	8.2	447400.	95.0	120.0	76.0	95.0	66.0	76.0
22.65	8.7	8.7	8.7	8.7	454070.	73.0	83.0	69.0	73.0	65.0	69.0
24.40	8.0	8.1	8.0	8.1	455260.	72.0	80.0	70.0	72.0	66.0	70.0
25.65	8.0	7.9	8.0	7.9	456116.	76.0	83.0	73.0	76.0	70.0	73.0
26.92	8.1	8.1	8.1	8.2	456976.	75.0	82.0	72.0	75.0	69.0	72.0
29.05	7.9	8.0	7.9	8.3	458446.	76.0	83.0	74.0	76.0	71.0	74.0
30.68	8.1	8.4	8.1	8.4	459562.	75.0	81.0	73.0	75.0	70.0	73.0
39.08	10.0	10.0	9.7	9.3	465820.	75.0	81.0	73.0	75.0	70.0	73.0
						72.0	77.0	71.0	72.0	69.0	71.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
309.0	218.0	308.0	230.0	308.0	226.0	308.0	230.0	218.0	171.0	230.0	173.0	226.0	183.0	230.0	178.0
312.0	220.0	312.0	232.0	312.0	230.0	311.0	230.0	220.0	171.0	232.0	173.0	230.0	184.0	230.0	177.0
310.0	225.0	310.0	233.0	310.0	236.0	310.0	235.0	225.0	177.0	233.0	176.0	236.0	189.0	235.0	185.0
314.0	232.0	314.0	239.0	314.0	239.0	314.0	239.0	232.0	184.0	239.0	186.0	239.0	194.0	239.0	191.0
314.0	250.0	314.0	255.0	314.0	252.0	314.0	252.0	250.0	202.0	255.0	205.0	252.0	205.0	252.0	206.0
314.0	245.0	314.0	247.0	314.0	247.0	314.0	247.0	245.0	193.0	247.0	202.0	247.0	201.0	247.0	201.0
311.0	260.0	310.0	263.0	311.0	261.0	311.0	261.0	260.0	216.0	263.0	223.0	261.0	222.0	261.0	222.0
309.0	260.0	309.0	262.0	309.0	260.0	309.0	259.0	260.0	216.0	262.0	222.0	260.0	222.0	259.0	222.0
310.0	262.0	310.0	264.0	310.0	262.0	310.0	262.0	262.0	219.0	264.0	225.0	262.0	226.0	262.0	226.0
313.0	267.0	313.0	269.0	314.0	266.0	314.0	266.0	267.0	224.0	269.0	229.0	266.0	230.0	266.0	230.0
312.0	268.0	311.0	270.0	311.0	268.0	312.0	268.0	268.0	228.0	270.0	233.0	268.0	233.0	268.0	233.0
311.0	270.0	311.0	271.0	311.0	270.0	311.0	270.0	270.0	231.0	271.0	235.0	270.0	235.0	270.0	236.0
313.0	283.0	313.0	249.0	313.0	275.0	309.0	280.0	283.0	253.0	249.0	202.0	275.0	249.0	280.0	252.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
171.0	137.0	173.0	142.0	183.0	153.0	178.0	148.0
171.0	136.0	173.0	142.0	184.0	153.0	177.0	148.0
177.0	142.0	178.0	147.0	189.0	158.0	185.0	155.0
184.0	147.0	186.0	154.0	194.0	161.0	191.0	160.0
202.0	164.0	205.0	170.0	205.0	171.0	206.0	171.0
193.0	160.0	202.0	169.0	201.0	170.0	201.0	170.0
216.0	184.0	223.0	192.0	222.0	192.0	222.0	191.0
216.0	184.0	222.0	192.0	222.0	193.0	222.0	193.0
219.0	188.0	225.0	196.0	226.0	196.0	226.0	196.0
224.0	193.0	229.0	202.0	230.0	202.0	230.0	202.0
228.0	197.0	233.0	205.0	233.0	207.0	233.0	207.0
231.0	201.0	235.0	207.0	235.0	209.0	236.0	208.0
253.0	227.0	202.0	173.0	249.0	224.0	252.0	228.0

RESULTS FROM THE NINTH RUN

THIS RUN STARTED MARCH 9, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 45,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 24 PPM
- C. SILICA : 400 PPM
- D. CARBONATE: 800 PPM
- E. PH : 7.1
- F. ADDITIVE : NONE
- G. OTHER : NONE

FLOW RATES						MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS	
5397.4	178.0	180.5	180.5	180.5	.00	98.5	82.5	87.8	82.5	87.8	.00	
5474.1	175.5	180.1	180.1	184.9	1.45	106.1	91.2	94.0	95.5	96.7	1.45	
5261.9	182.6	187.3	194.4	194.4	3.25	101.1	91.5	90.4	91.9	93.7	3.25	
5467.4	180.0	180.0	180.0	191.6	4.73	93.1	83.4	83.4	88.8	87.2	4.73	
4593.4	189.3	189.3	189.3	187.0	6.50	133.6	121.1	128.5	126.9	127.5	6.50	
5663.3	194.0	198.7	198.7	191.6	12.88	75.5	74.7	74.7	72.0	74.2	12.88	
5644.3	203.6	203.7	203.6	203.6	22.65	57.3	52.6	56.1	56.1	55.5	22.65	
5680.7	187.4	189.8	187.4	189.8	24.40	50.8	49.1	50.8	52.7	50.9	24.40	
5717.0	187.3	185.0	187.3	185.0	25.65	50.0	47.0	50.0	49.3	49.1	25.65	
5717.0	189.4	189.4	189.3	191.6	26.92	48.1	45.8	50.2	50.8	48.7	26.92	
5671.4	184.8	187.2	184.9	194.2	29.05	42.9	40.4	42.0	45.1	42.6	29.05	
6187.7	189.6	196.6	189.6	196.6	30.68	43.4	43.8	43.4	45.0	43.9	30.68	
5572.9	233.6	233.8	226.8	217.9	39.08	30.0	69.4	37.5	27.4	41.1	39.08	

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
71.0	83.0	60.7	74.0	72.2	.00	56.4	50.0	43.2	45.4	48.8	.00
71.5	84.1	62.9	76.7	73.8	1.45	67.0	58.0	51.6	52.6	57.3	1.45
69.0	78.6	65.8	71.4	71.2	3.25	63.9	55.9	51.9	51.9	55.9	3.25
72.9	78.0	64.1	73.7	72.2	4.73	62.4	51.4	49.3	50.2	53.3	4.73
122.1	123.7	117.4	113.0	119.1	6.50	95.5	84.4	81.6	82.6	86.0	6.50
59.7	50.9	52.2	50.4	53.3	12.88	60.3	57.1	53.6	51.7	55.6	12.88
38.8	34.3	33.7	33.7	35.1	22.65	50.6	46.4	45.0	46.7	47.2	22.65
42.8	38.4	36.2	35.8	38.3	24.40	44.2	39.8	37.8	38.3	40.0	24.40
41.5	36.2	34.0	33.5	36.3	25.65	41.4	36.3	37.9	37.5	38.3	25.65
35.8	32.6	29.5	29.9	31.9	26.92	41.8	34.6	35.7	36.2	37.1	26.92
32.4	29.7	27.9	29.3	29.8	29.05	39.9	34.9	31.7	33.3	35.0	29.05
32.7	30.9	29.0	29.1	30.4	30.68	39.5	37.0	32.9	36.7	36.5	30.68
22.8	45.5	19.8	20.0	27.0	39.08	28.3	45.5	26.9	24.3	31.3	39.08

THIS IS THE INPUT DATA FOR THE NINTH RUN
THIS RUN STARTED MARCH 9, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 45,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 24 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 7.1
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	316.0	100.0	5.1	66.0	80.0	194996.
1.450	319.0	104.0	5.1	67.0	80.0	196077.
3.250	316.0	104.0	5.0	68.0	80.0	197438.
4.733	320.0	105.0	5.0	67.0	80.0	198515.
6.500	319.0	105.0	5.0	66.0	81.0	199522.
12.880	317.0	112.0	4.8	65.5	79.0	203475.
22.650	314.0	110.0	4.7	66.0	77.0	209548.
24.400	313.0	128.0	5.2	70.0	82.0	210627.
25.650	313.0	129.0	5.3	69.0	81.0	211405.
26.917	318.0	133.0	5.1	71.0	82.0	212184.
29.050	315.0	136.0	5.1	70.0	80.0	213513.
30.683	314.0	139.0	5.1	70.0	81.0	214518.
39.076	313.5	146.5	5.1	69.0	78.0	220235.

RESULTS FROM THE MAIN EXCHANGER FOR THE NINTH RUN

THIS RUN STARTED MARCH 9, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 45,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 24 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 7.1
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
476.3	6188.1	99040.0	86459.8	86.3	.00
475.6	6276.0	98482.8	81424.9	77.8	1.45
467.0	6028.0	95323.9	72191.2	73.0	3.25
466.1	4730.3	96517.4	61371.2	67.1	4.73
466.3	5141.8	96108.7	76973.1	75.1	6.50
443.4	5140.5	87575.2	69527.6	60.6	12.88
439.4	5120.8	86327.9	56272.8	55.2	22.65
486.4	5164.1	86750.5	61845.2	51.4	24.40
495.7	5102.3	87946.4	61105.4	50.6	25.65
475.9	5169.6	84931.4	56752.3	46.5	26.92
476.5	5108.3	82295.6	50981.1	42.3	29.05
476.8	5652.8	80505.3	62056.2	44.8	30.68
476.9	5363.3	76877.4	48173.2	36.5	39.08

THIS IS THE INPUT DATA FOR THE TENTH RUN

THIS RUN STARTED MARCH 30, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 7.1
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1		EXCH 2		EXCH 3	
						IN	OUT	IN	OUT	IN	OUT
.00	7.6	7.6	7.4	7.4	489724.	84.0	97.0	77.0	84.0	74.0	77.0
1.00	8.1	8.1	7.9	7.9	490354.	89.0	102.0	81.0	89.0	78.0	81.0
2.38	7.8	7.9	7.7	7.9	491227.	92.0	105.0	84.0	92.0	80.0	84.0
3.48	7.8	7.9	7.8	8.2	491914.	94.0	106.0	87.0	94.0	83.0	87.0
5.32	7.8	8.0	7.8	8.3	493059.	91.0	101.0	84.0	91.0	80.0	84.0
6.02	7.8	8.0	7.9	8.3	493504.	90.0	101.0	84.0	90.0	79.0	84.0
15.65	7.4	7.6	7.4	7.9	499750.	85.0	91.0	79.0	85.0	75.0	79.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
316.0	204.0	315.0	207.0	315.0	210.0	315.0	204.0	204.0	160.0	207.0	154.0	210.0	153.0	204.0	159.0
320.0	217.0	318.0	220.0	319.0	224.0	319.0	217.0	217.0	169.0	220.0	168.0	224.0	166.0	217.0	163.0
322.0	224.0	322.0	226.0	321.0	227.0	322.0	225.0	224.0	175.0	226.0	174.0	227.0	172.0	225.0	171.0
323.0	236.0	322.0	237.0	322.0	236.0	322.0	236.0	236.0	186.0	237.0	185.0	236.0	182.0	236.0	182.0
323.0	249.0	322.0	249.0	322.0	249.0	323.0	247.0	249.0	200.0	249.0	200.0	249.0	198.0	247.0	199.0
323.0	251.0	322.0	251.0	322.0	252.0	322.0	250.0	251.0	203.0	251.0	203.0	252.0	203.0	250.0	202.0
321.0	269.0	320.0	269.0	320.0	269.0	320.0	269.0	269.0	227.0	269.0	229.0	269.0	229.0	269.0	228.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
160.0	129.0	154.0	129.0	153.0	127.0	159.0	128.0
169.0	135.0	168.0	137.0	166.0	134.0	163.0	134.0
175.0	142.0	174.0	142.0	172.0	142.0	171.0	141.0
186.0	150.0	185.0	149.0	182.0	148.0	182.0	147.0
200.0	164.0	200.0	164.0	198.0	162.0	199.0	161.0
203.0	167.0	203.0	166.0	203.0	166.0	202.0	165.0
227.0	195.0	229.0	197.0	229.0	198.0	228.0	197.0

RESULTS FROM THE TENTH RUN
THIS RUN STARTED MARCH 30, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 7.1
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
5211.5	176.3	176.4	174.0	171.7	.00	124.8	119.2	113.1	120.7	119.4	.00
5227.9	187.6	187.8	185.4	185.4	1.00	120.3	113.8	107.1	118.0	114.8	1.00
5158.2	181.6	183.9	179.4	183.9	2.38	111.8	110.1	105.0	111.7	109.6	2.38
5138.4	181.5	183.9	181.6	190.9	3.48	96.4	95.3	95.6	100.5	97.0	3.48
5254.6	181.5	186.3	181.6	193.1	5.32	76.2	77.3	75.4	83.8	78.1	5.32
5361.1	181.5	186.3	183.9	193.2	6.02	79.4	80.5	78.1	84.9	80.7	6.02
5305.9	172.4	178.3	173.6	184.1	15.65	44.4	45.1	43.9	46.6	45.0	15.65

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS				
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F
86.0	106.2	112.0	86.2	97.6	77.6	65.1	68.5	76.7	72.0
94.4	101.8	111.6	108.7	104.1	80.2	72.4	76.6	70.7	75.0
91.3	97.9	101.7	103.8	98.7	81.6	80.7	74.6	77.6	78.6
79.6	84.0	87.8	92.3	85.9	77.0	79.0	75.4	82.3	78.4
71.2	73.0	74.7	75.0	73.5	63.0	64.7	64.4	72.4	66.1
64.3	66.0	66.3	68.9	66.4	68.0	72.1	71.2	75.6	71.7
49.9	48.8	47.5	51.8	49.5	43.5	44.3	41.6	44.5	43.5

THIS IS THE INPUT DATA FOR THE TENTH RUN
THIS RUN STARTED MARCH 30, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 7.1
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	326.0	99.0	5.1	75.0	92.0	328108.
1.000	328.0	99.0	5.1	78.0	94.0	328813.
2.380	329.0	101.0	5.3	80.0	97.0	329796.
3.480	329.0	103.0	5.2	83.0	99.0	330570.
5.320	330.0	103.0	5.1	80.0	96.0	331863.
6.020	329.0	102.0	5.1	80.0	96.0	332364.
15.650	329.0	111.0	5.1	75.5	90.5	339405.

RESULTS FROM THE MAIN EXCHANGER FOR THE TENTH RUN
THIS RUN STARTED MARCH 30, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 50,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 7.1
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
474.0	5837.8	103642.1	99043.8	133.1	.00
473.4	5896.0	104467.4	94147.9	143.4	1.00
491.9	5820.7	108058.2	98753.6	159.3	2.38
482.6	5810.8	105102.7	92786.1	153.5	3.48
468.5	5921.8	102479.3	94558.8	129.4	5.32
468.7	6049.5	102516.1	96598.6	137.1	6.02
468.7	5979.1	98507.4	89507.5	86.1	15.65

THIS IS THE INPUT DATA FOR THE ELEVENTH RUN
THIS RUN STARTED APRIL 6, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 22 PPM
C. SILICA : 445 PPM
D. CARBONATE: 890 PPM
E. PH : 7.1
F. ADDITIVE : BETZ 403
1. LEVEL : 90 PPM
G. OTHER :

TIME HOURS	FLOWS					COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1		TUBE 2		TUBE 4		EXCH 1		EXCH 2		EXCH 3	
	GAGE	GAGE	GAGE	GAGE			IN	OUT	IN	OUT	IN	OUT
.00	7.5	7.7	7.6	7.5	527285.	89.0	102.0	84.0	89.0	80.0	84.0	
1.60	7.2	7.4	7.4	7.5	528300.	90.0	100.0	83.0	90.0	80.0	83.0	
6.02	7.0	7.2	7.2	7.4	531245.	81.0	88.0	75.0	81.0	70.0	75.0	
16.78	7.2	7.8	7.6	7.7	538440.	80.0	87.0	74.0	80.0	70.0	74.0	
18.45	7.0	7.6	7.6	7.5	539536.	84.0	91.0	79.0	84.0	75.0	79.0	
20.10	7.1	7.6	7.6	7.8	540633.	87.0	94.0	83.0	87.0	79.0	83.0	
21.80	7.1	7.6	7.6	7.8	541762.	89.0	94.0	85.0	89.0	81.0	85.0	
23.77	7.1	7.6	7.6	7.8	543066.	91.0	96.0	87.0	91.0	83.0	87.0	

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
314.0	216.0	314.0	223.0	313.0	228.0	314.0	222.0	216.0	161.0	223.0	161.0	228.0	162.0		
315.0	230.0	314.0	237.0	314.0	241.0	314.0	237.0	230.0	172.0	237.0	178.0	241.0	177.0		
315.0	256.0	314.0	258.0	314.0	261.0	314.0	258.0	256.0	204.0	258.0	207.0	261.0	205.0		
317.0	261.0	317.0	265.0	317.0	265.0	317.0	264.0	261.0	214.0	265.0	216.0	265.0	212.0		
314.0	262.0	313.0	264.0	314.0	265.0	314.0	264.0	262.0	217.0	264.0	219.0	265.0	216.0		
312.0	265.0	312.0	267.0	312.0	267.0	312.0	267.0	265.0	223.0	267.0	225.0	267.0	222.0		
310.0	265.0	310.0	267.0	310.0	267.0	310.0	267.0	265.0	225.0	267.0	228.0	267.0	225.0		
310.0	268.0	310.0	271.0	310.0	268.0	310.0	269.0	268.0	231.0	271.0	235.0	268.0	231.0		

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
161.0	130.0	161.0	133.0	162.0	131.0	164.0	134.0
172.0	139.0	178.0	141.0	177.0	140.0	177.0	142.0
204.0	164.0	207.0	166.0	205.0	163.0	205.0	166.0
214.0	176.0	216.0	174.0	212.0	175.0	214.0	178.0
217.0	180.0	219.0	183.0	216.0	178.0	218.0	182.0
223.0	186.0	225.0	184.0	222.0	186.0	224.0	190.0
225.0	190.0	228.0	194.0	225.0	191.0	227.0	193.0
231.0	200.0	235.0	208.0	231.0	203.0	233.0	205.0

RESULTS FROM THE ELEVENTH RUN
THIS RUN STARTED APRIL 6, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 22 PPM
C. SILICA : 445 PPM
D. CARBONATE: 890 PPM
E. PH : 7.1
F. ADDITIVE : BETZ 403
I. LEVEL : 90 PPM
G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1				
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	OVERALL HEAT TRANSFER COEFFICIENTS			
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	TUBE1	TUBE2	TUBE3	TUBE4
							BTU/HR. SQ.FT.	DEG. F	AVERAGE
5242.5	175.3	180.0	177.7	175.3	.00	116.7	108.4	98.5	107.2
5512.2	168.2	172.9	172.9	175.3	1.60	90.5	82.5	77.2	83.5
5538.4	163.5	168.3	168.3	171.8	6.02	53.3	51.9	48.7	53.0
5449.7	168.0	182.0	177.4	179.7	16.78	50.4	50.2	48.9	50.6
5506.4	163.6	177.7	178.8	175.3	18.45	48.9	49.9	49.9	50.1
5497.1	166.1	179.0	177.8	182.5	20.10	47.3	48.6	48.2	49.5
5495.7	166.3	179.1	176.8	182.6	21.80	39.4	40.4	39.9	41.2
5494.5	166.3	179.1	176.8	182.6	23.77	38.0	37.7	40.4	40.6

MINI EXCHANGER NUMBER 2					MINI EXCHANGER NUMBER 3				
OVERALL HEAT TRANSFER COEFFICIENTS					OVERALL HEAT TRANSFER COEFFICIENTS				
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4
					HOURS				
							BTU/HR. SQ.FT.	DEG. F	AVERAGE
84.2	94.7	97.1	85.1	90.2	.00	93.6	84.4	93.4	85.5
90.8	89.7	96.5	93.0	92.5	1.60	68.6	75.2	76.2	71.9
59.0	58.5	64.1	62.5	61.0	6.02	64.5	66.5	69.8	65.1
51.6	57.3	61.2	58.2	57.1	16.78	51.6	53.3	53.7	51.8
47.0	50.4	55.6	51.0	51.0	18.45	50.3	52.1	57.2	51.8
41.0	43.7	46.9	45.7	44.3	20.10	50.7	50.4	53.0	50.1
40.5	41.9	45.0	43.9	42.8	21.80	48.4	49.3	49.8	50.6
38.5	39.5	41.0	40.8	40.0	23.77	44.8	40.2	42.5	43.3

THIS IS THE INPUT DATA FOR THE ELEVENTH RUN
THIS RUN STARTED APRIL 6, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 22 PPM
C. SILICA : 445 PPM
D. CARBONATE: 890 PPM
E. PH : 7.1
F. ADDITIVE : BETZ 403
I. LEVEL : 90 PPM
G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	324.0	109.0	5.3	80.0	97.0	348030.
1.600	324.0	104.0	5.2	79.0	96.0	349085.
6.017	324.0	104.0	5.4	70.0	86.0	352143.
16.783	325.0	111.0	5.3	70.0	86.0	359681.
18.450	322.0	116.0	5.4	75.0	90.0	360825.
20.100	320.0	120.0	5.3	79.0	93.0	361973.
21.800	318.0	126.0	5.1	81.0	95.0	363150.
23.767	318.0	132.0	5.1	82.0	97.0	364512.

RESULTS FROM THE MAIN EXCHANGER FOR THE ELEVENTH RUN
THIS RUN STARTED APRIL 6, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 22 PPM
C. SILICA : 445 PPM
D. CARBONATE: 890 PPM
E. PH : 7.1
F. ADDITIVE : BETZ 403
I. LEVEL : 90 PPM
G. OTHER :

BRINE	COOLH2O	BRINE	COOLH2O	OVERALL	RUN
FLOW	FLOW	FLUX	FLUX	HTC	TIME
LB/HR	LB/HR	BTU/HR	BTU/HR	BTU/HR SQFT DEG F	HOURS
493.1	5454.5	102162.8	92541.6	110.6	.00
483.8	5745.7	102533.9	97821.2	128.8	1.60
502.4	5789.3	106477.6	92443.6	95.5	6.02
492.8	5689.5	101657.8	90849.3	82.0	16.78
502.9	5763.5	99860.9	86279.9	79.7	18.45
494.0	5731.9	95260.6	80086.5	75.1	20.10
475.9	5730.2	88106.3	80062.8	69.1	21.80
475.9	5736.7	85385.2	85878.2	67.6	23.77

THIS IS THE INPUT DATA FOR THE TWELFTH RUN

THIS RUN STARTED APRIL 14, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 28 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 7.0
F. ADDITIVE : HERCULES AF-504
1. LEVEL : 20 PPM
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3	
.00	6.9	6.8	6.8	7.1	549814.	IN	OUT	IN	OUT	IN	OUT
1.17	6.9	6.8	6.8	7.3	550565.	90.0	103.0	84.0	90.0	82.0	84.0
3.23	7.2	7.1	7.1	7.0	551908.	92.0	105.0	86.0	92.0	84.0	86.0
4.55	7.2	7.1	7.1	7.0	552758.	91.0	105.0	85.0	91.0	83.0	85.0
9.27	6.9	7.0	6.9	6.8	553765.	90.0	102.0	85.0	90.0	83.0	85.0
20.20	6.8	6.9	6.8	6.7	562822.	85.0	93.0	79.0	85.0	76.0	79.0
22.18	6.9	7.0	6.8	7.0	564084.	83.0	91.0	78.0	83.0	75.0	78.0
23.22	7.6	7.6	7.6	7.6	564750.	86.0	95.0	82.0	88.0	79.0	82.0
						90.0	98.0	84.0	90.0	81.0	84.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
312.0	202.0	310.0	208.0	310.0	210.0	311.0	199.0	202.0	164.0	208.0	146.0	210.0	156.0	199.0	160.0
311.0	210.0	310.0	210.0	310.0	214.0	310.0	201.0	210.0	164.0	210.0	150.0	214.0	160.0	201.0	159.0
310.0	208.0	308.0	208.0	309.0	210.0	309.0	202.0	208.0	168.0	208.0	153.0	210.0	154.0	202.0	158.0
310.0	214.0	310.0	214.0	310.0	214.0	310.0	208.0	214.0	172.0	214.0	158.0	214.0	158.0	208.0	161.0
310.0	244.0	310.0	243.0	310.0	241.0	310.0	241.0	244.0	198.0	243.0	195.0	241.0	192.0	241.0	195.0
307.0	246.0	307.0	246.0	307.0	243.0	307.0	243.0	246.0	203.0	246.0	201.0	243.0	196.0	243.0	202.0
310.0	249.0	310.0	247.0	310.0	249.0	310.0	247.0	249.0	205.0	247.0	204.0	249.0	200.0	247.0	203.0
310.0	250.0	310.0	250.0	310.0	249.0	310.0	249.0	250.0	207.0	250.0	206.0	249.0	203.0	249.0	207.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
164.0	130.0	146.0	124.0	156.0	128.0	160.0	128.0
164.0	132.0	150.0	128.0	160.0	132.0	159.0	130.0
168.0	131.0	153.0	129.0	154.0	128.0	158.0	130.0
172.0	133.0	158.0	131.0	158.0	131.0	161.0	131.0
198.0	160.0	195.0	160.0	192.0	158.0	195.0	160.0
203.0	166.0	201.0	168.0	196.0	163.0	202.0	168.0
205.0	170.0	204.0	170.0	200.0	166.0	203.0	170.0
207.0	173.0	206.0	174.0	203.0	172.0	207.0	175.0

RESULTS FROM THE TWELFTH RUN

THIS RUN STARTED APRIL 14, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 28 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 7.0
F. ADDITIVE : HERCULES AF-504
1. LEVEL : 20 PPM
G. OTHER :

MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS											TIME HOURS
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	
						BTU/HR. SQ.FT. DEG. F					
5317.1	161.4	159.2	159.2	166.2	.00	126.5	113.4	110.3	134.6	121.2	.00
5368.8	161.5	159.2	159.2	170.9	1.17	116.8	114.3	108.0	139.0	119.5	1.17
5330.4	168.6	166.4	166.3	164.0	3.23	126.9	123.4	120.9	133.2	126.1	3.23
5268.2	168.6	166.3	166.3	163.9	4.55	108.0	106.5	106.5	114.2	108.8	4.55
5343.8	161.6	163.9	161.6	159.2	9.27	61.5	63.5	64.9	63.9	63.5	9.27
5270.9	159.5	161.6	159.5	157.1	20.20	57.8	58.7	61.2	60.3	59.5	20.20
5330.3	161.6	163.9	159.2	163.9	22.18	55.3	58.3	54.5	58.3	56.6	22.18
5320.7	178.0	178.0	178.0	178.0	23.22	62.5	62.5	63.7	63.7	63.1	23.22

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
						BTU/HR. SQ.FT. DEG. F					
70.8	125.6	100.9	77.8	93.8	.00	73.7	57.4	64.6	74.9	67.6	.00
82.8	117.1	96.6	86.0	95.6	1.17	71.6	56.1	63.5	72.6	66.0	1.17
73.3	109.6	109.8	85.8	94.6	3.23	81.6	59.3	64.4	65.0	67.6	3.23
65.5	93.7	93.7	78.1	82.8	4.55	80.1	61.1	61.1	65.6	67.0	4.55
59.7	64.2	63.9	60.2	62.5	9.27	55.8	52.8	51.9	51.3	53.0	9.27
50.2	53.7	56.9	47.8	52.1	20.20	51.1	46.1	47.7	45.9	47.7	20.20
57.2	57.3	64.0	58.8	59.3	22.18	49.4	48.9	49.4	47.7	48.8	22.18
59.6	61.2	65.0	58.4	61.1	23.22	51.7	48.6	48.2	48.1	49.1	23.22

THIS IS THE INPUT DATA FOR THE TWELFTH RUN
 THIS RUN STARTED APRIL 14, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 28 PPM
 C. SILICA : 420 PPM
 D. CARBONATE: 840 PPM
 E. PH : 7.0
 F. ADDITIVE : HERCULES AF-504
 I. LEVEL : 20 PPM
 G. OTHER :

TIME	BRINE INLET	BRINE OUTLET	BRINE FLOW	COOLH2O INLET	COOLH2O OUTLET	COOLH2O FLOWRATE
HOURS	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	321.0	111.0	5.2	82.0	102.0	414050.
1.167	320.0	111.0	5.3	84.0	102.0	414805.
3.233	318.0	111.0	5.2	83.0	102.0	416156.
4.550	319.0	110.0	5.2	82.0	99.0	417013.
9.267	319.0	121.0	5.2	76.0	94.0	420065.
20.200	316.0	128.0	5.4	76.0	92.0	427261.
22.183	319.0	131.0	5.3	79.0	96.0	428550.
23.217	318.0	134.0	4.8	82.0	97.0	429227.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWELFTH RUN
 THIS RUN STARTED APRIL 14, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 28 PPM
 C. SILICA : 420 PPM
 D. CARBONATE: 840 PPM
 E. PH : 7.0
 F. ADDITIVE : HERCULES AF-504
 I. LEVEL : 20 PPM
 G. OTHER :

BRINE FLOW	COOLH2O FLOW	BRINE FLUX	COOLH2O FLUX	OVERALL HTC	RUN TIME
LB/HR	LB/HR	BTU/HR	BTU/HR	BTU/HR SQ FT DEG F	HOURS
484.5	5346.5	98039.7	106715.6	130.5	.00
494.0	5404.0	99490.9	97077.7	125.7	1.17
485.2	5377.6	96760.4	101969.5	127.9	3.23
485.0	5350.2	97648.4	90771.6	112.4	4.55
485.0	5448.0	92573.2	97867.9	81.9	9.27
504.3	5382.6	91433.3	85948.8	68.6	20.20
494.3	5417.3	89644.5	91909.6	71.1	22.18
447.9	5407.6	79508.4	80951.9	62.0	23.22

THIS IS THE INPUT DATA FOR THE THIRTEENTH RUN
 THIS RUN STARTED APRIL 20, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 21 PPM
 C. SILICA : 420 PPM
 D. CARBONATE: 840 PPM
 E. PH : 6.8
 F. ADDITIVE : BELGARD E. V.
 I. LEVEL : 20 PPM
 G. OTHER :

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1		EXCH 2		EXCH 3	
.00	6.9	6.7	7.0	6.5	611143.	83.0	94.0	76.0	83.0	73.0	76.0
.97	7.4	7.2	7.3	7.5	611769.	83.0	96.0	78.0	83.0	75.0	78.0
2.85	7.7	7.5	7.5	7.8	613010.	81.0	92.0	74.0	81.0	71.0	74.0
3.52	7.8	7.5	7.8	8.0	613452.	82.0	92.0	77.0	82.0	72.0	77.0
4.80	7.5	7.3	7.3	7.8	614292.	88.0	97.0	82.0	88.0	77.0	82.0
7.57	7.5	7.3	7.3	7.8	616103.	85.0	93.0	81.0	85.0	76.0	81.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
314.0	217.0	312.0	211.0	312.0	210.0	314.0	209.0	217.0	160.0	211.0	155.0	210.0	160.0		
316.0	219.0	314.0	217.0	312.0	214.0	314.0	215.0	219.0	164.0	217.0	163.0	214.0	163.0		
315.0	226.0	313.0	225.0	312.0	223.0	314.0	222.0	226.0	171.0	225.0	168.0	223.0	169.0		
318.0	237.0	316.0	237.0	315.0	230.0	317.0	230.0	237.0	178.0	237.0	176.0	230.0	178.0		
319.0	241.0	318.0	242.0	317.0	237.0	318.0	238.0	241.0	192.0	242.0	190.0	237.0	189.0		
320.0	262.0	320.0	262.0	320.0	262.0	320.0	259.0	262.0	218.0	262.0	216.0	262.0	216.0		

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
160.0	127.0	155.0	120.0	160.0	118.0	154.0	125.0
164.0	131.0	163.0	126.0	163.0	119.0	162.0	129.0
171.0	136.0	169.0	129.0	169.0	121.0	169.0	131.0
178.0	141.0	176.0	135.0	178.0	128.0	180.0	140.0
192.0	152.0	190.0	146.0	189.0	150.0	190.0	150.0
218.0	183.0	216.0	178.0	216.0	172.0	216.0	178.0

RESULTS FROM THE THIRTEENTH RUN
THIS RUN STARTED APRIL 20, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 21 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.8
F. ADDITIVE : BELGARD E. V.
I. LEVEL : 20 PPM
B. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS
5358.4	161.3	156.7	163.8	151.9	.00	94.7	98.4	104.2	99.4	99.2	.00
5453.0	172.8	168.3	170.8	175.3	.97	108.2	106.7	111.1	114.2	110.0	.97
5487.3	179.9	175.4	175.5	182.3	2.85	93.9	91.3	93.2	99.9	94.6	2.85
5421.4	181.9	175.1	182.2	186.7	3.52	81.1	76.5	87.7	91.6	84.2	3.52
5414.2	174.9	170.3	170.4	181.9	4.80	75.8	71.9	77.0	81.8	76.6	4.80
5426.6	174.8	170.1	170.1	181.8	7.57	56.6	55.1	55.1	62.4	57.3	7.57

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	SG.FT.	DEG. F		HOURS		BTU/HR.	SG.FT.	DEG. F		HOURS
97.5	98.2	89.3	94.9	95.0	.00	73.0	83.0	102.9	53.9	80.7	.00
82.2	79.6	77.2	82.5	80.4	.97	72.3	83.1	107.6	75.6	84.7	.97
89.2	91.9	87.2	89.3	89.4	2.85	66.8	77.9	102.2	77.2	81.0	2.85
77.0	77.3	69.6	67.9	72.9	3.52	81.9	72.3	122.7	90.6	96.9	3.52
69.3	72.0	67.9	71.9	70.3	4.80	80.9	91.1	79.0	86.1	84.2	4.80
45.1	46.2	46.2	46.5	46.0	7.57	54.6	59.5	70.9	63.6	62.2	7.57

THIS IS THE INPUT DATA FOR THE THIRTEENTH RUN
THIS RUN STARTED APRIL 20, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 21 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.8
F. ADDITIVE : BELGARD E. V.
I. LEVEL : 20 PPM
B. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	326.0	100.0	5.3	73.0	93.0	490185.
.967	326.0	100.0	5.0	75.0	94.0	490854.
2.850	325.0	98.0	4.9	70.0	90.0	492180.
3.517	326.0	98.0	4.9	72.0	90.0	492652.
4.800	328.0	104.0	5.2	77.0	94.0	493553.
7.567	328.0	114.0	5.2	76.0	92.0	495475.

RESULTS FROM THE MAIN EXCHANGER FOR THE THIRTEENTH RUN
THIS RUN STARTED APRIL 20, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 21 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.8
F. ADDITIVE : BELGARD E. V.
I. LEVEL : 20 PPM
B. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
492.6	5727.6	107238.8	114322.8	145.8	.00
464.7	5828.8	101168.6	110525.6	146.1	.97
455.7	5862.0	99613.2	117006.3	136.3	2.85
455.4	5817.4	100010.0	104504.1	128.3	3.52
482.8	5749.5	104222.9	97546.0	119.0	4.80
482.8	5788.8	99632.8	92436.1	86.4	7.57

THIS IS THE INPUT DATA FOR THE FOURTEENTH RUN

THIS RUN STARTED APRIL 27, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 21 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.8
F. ADDITIVE : DOW CORNING B-2083-78
I. LEVEL : 20 PPM
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.4	7.1	7.1	7.2	624985.	91.0	104.0	84.0	91.0	82.0	84.0
1.02	7.8	7.6	7.6	8.0	625622.	93.0	105.0	87.0	93.0	83.0	87.0
1.90	7.5	7.4	7.3	7.5	626160.	95.0	106.0	88.0	95.0	85.0	88.0
3.50	7.5	7.2	7.2	7.2	627178.	95.0	105.0	89.0	95.0	86.0	89.0
4.73	7.6	7.4	7.4	7.4	627951.	95.0	105.0	88.0	95.0	85.0	88.0
12.80	7.8	7.4	7.6	7.7	633090.	85.0	93.5	80.0	85.0	75.5	80.0
20.47	8.0	7.8	8.0	8.1	637859.	83.0	90.0	79.0	83.0	75.0	79.0
21.87	8.1	7.9	8.0	8.0	638732.	86.0	94.0	83.0	86.0	78.0	83.0
22.82	7.8	7.5	7.5	7.6	639321.	89.0	96.0	85.0	89.0	81.0	85.0
24.80	7.1	7.2	7.0	8.0	640554.	91.0	97.0	88.0	91.0	84.0	88.0
27.13	7.8	7.9	7.8	7.8	642001.	93.0	99.0	91.0	93.0	87.0	91.0
28.88	8.0	8.0	7.9	7.9	643104.	92.0	99.0	91.0	92.0	86.0	91.0
37.02	8.0	8.1	7.8	7.8	648310.	83.5	88.0	82.0	83.5	78.5	82.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
312.0	209.0	311.0	215.0	311.0	214.0	311.0	215.0	209.0	161.0	215.0	154.0	214.0	156.0	215.0	160.0
312.0	214.0	312.0	218.0	312.0	218.0	312.0	220.0	214.0	164.0	218.0	163.0	218.0	163.0	220.0	164.0
314.0	216.0	313.0	220.0	313.0	220.0	313.0	223.0	216.0	166.0	220.0	166.0	220.0	165.0	223.0	169.0
314.0	218.0	313.0	224.0	313.0	224.0	313.0	227.0	218.0	169.0	224.0	169.0	224.0	168.0	227.0	176.0
314.0	224.0	314.0	229.0	314.0	229.0	314.0	231.0	224.0	174.0	229.0	174.0	229.0	174.0	231.0	182.0
313.0	241.5	313.0	244.0	313.0	244.0	313.0	244.5	241.5	193.0	244.0	193.5	244.0	193.0	244.5	198.0
316.0	258.0	314.0	261.0	314.0	261.0	314.0	261.0	258.0	214.0	261.0	214.0	261.0	215.0	261.0	218.0
316.0	264.0	314.0	264.0	314.0	264.0	315.0	265.0	264.0	219.0	264.0	219.0	264.0	220.0	265.0	225.0
316.0	264.0	315.0	266.0	315.0	266.0	315.0	266.0	264.0	222.0	266.0	222.0	266.0	222.0	266.0	224.0
316.0	264.0	315.0	265.0	316.0	270.0	316.0	266.0	264.0	223.0	265.0	223.0	270.0	230.0	266.0	227.0
318.0	271.0	316.0	271.0	316.0	271.0	316.0	271.0	271.0	230.0	271.0	230.0	271.0	231.0	271.0	233.0
318.0	271.0	317.0	272.0	317.0	272.0	318.0	272.0	271.0	232.0	272.0	232.0	272.0	232.0	272.0	235.0
316.0	273.0	316.0	273.0	316.0	272.5	316.5	272.5	273.0	238.5	273.0	239.0	272.5	239.0	272.5	241.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
161.0	132.0	154.0	130.0	156.0	131.0	160.0	132.0
164.0	133.0	163.0	134.0	163.0	136.0	164.0	136.0
166.0	136.0	166.0	136.0	165.0	138.0	169.0	139.0
169.0	138.0	169.0	138.0	168.0	139.0	176.0	142.0
174.0	141.0	174.0	141.0	174.0	142.0	182.0	145.0
193.0	155.0	193.5	156.6	193.0	157.0	198.0	157.0
214.0	172.0	214.0	174.0	215.0	176.0	218.0	176.0
219.0	178.0	219.0	180.0	220.0	183.0	225.0	182.0
222.0	180.0	222.0	181.0	222.0	184.0	224.0	183.0
223.0	184.0	223.0	185.0	230.0	192.0	227.0	184.0
230.0	191.0	230.0	192.0	231.0	196.0	233.0	194.0
232.0	194.0	232.0	196.0	232.0	199.0	235.0	198.0
238.5	202.0	239.0	202.0	239.0	206.0	241.0	203.5

RESULTS FROM THE FOURTEENTH RUN

THIS RUN STARTED APRIL 27, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 21 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.8
F. ADDITIVE : DOW CORNING B-2083-78
I. LEVEL : 20 PPM
G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						AVERAGE	TIME HOURS
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	BTU/HR. SQ.FT. DEG. F		
5174.1	173.1	166.2	166.2	168.5	.00	124.7	109.2	110.8	110.8	113.9	113.9	.00
5032.1	182.5	177.8	177.8	187.1	1.02	115.2	106.0	106.0	108.4	108.4	108.4	1.02
5255.8	175.3	173.0	170.7	175.4	1.90	110.8	102.5	101.1	99.4	103.4	103.4	1.90
5190.5	175.3	168.4	168.4	168.4	3.50	104.8	91.5	91.5	87.4	93.8	93.8	3.50
5259.4	177.6	172.9	172.9	172.9	4.73	99.1	89.5	89.5	86.8	91.2	91.2	4.73
5149.8	182.4	174.2	177.7	180.0	12.80	71.7	65.4	66.9	67.2	67.9	67.9	12.80
5161.9	186.8	182.3	187.0	189.3	20.47	55.9	49.7	51.0	51.6	52.0	52.0	20.47
5131.9	189.1	184.6	187.0	186.9	21.87	56.1	52.9	53.5	53.3	53.9	53.9	21.87
5144.6	182.1	175.2	175.2	177.5	22.82	52.9	47.8	47.8	48.4	49.2	49.2	22.82
5130.8	165.8	168.2	163.4	166.8	24.80	45.8	44.7	39.3	49.4	44.8	44.8	24.80
5211.8	181.9	184.5	182.1	182.1	27.13	45.6	44.5	43.9	43.9	44.5	44.5	27.13
5292.4	186.6	186.7	184.4	184.3	28.88	50.3	48.2	47.6	48.5	48.6	48.6	28.88
5221.9	186.8	189.1	182.1	182.1	37.02	36.3	36.7	35.8	36.2	36.3	36.3	37.02

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.			BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	
92.2	115.4	108.7	101.4	104.6	.00	68.0	57.9	58.9	64.4	62.3	.00
90.0	95.4	95.4	100.8	95.4	1.02	76.0	91.1	79.7	86.4	88.3	1.02
97.1	101.9	103.0	100.1	100.5	1.90	79.3	78.2	68.6	75.6	75.4	1.90
87.1	91.6	93.8	80.6	88.3	3.50	78.1	75.0	70.0	75.9	74.8	3.50
91.6	96.2	96.2	81.4	91.3	4.73	75.4	73.5	70.6	76.0	73.9	4.73
62.0	61.0	63.0	56.9	60.7	12.80	72.8	66.7	66.4	74.9	70.2	12.80
46.4	48.0	48.0	44.9	46.8	20.47	61.7	56.8	56.0	60.4	58.7	20.47
43.2	42.2	41.6	37.1	41.0	21.87	46.4	41.1	57.7	66.1	62.8	21.87
44.5	44.6	44.6	42.8	44.1	22.82	60.4	56.5	51.6	56.3	56.2	22.82
37.2	38.5	34.3	39.1	37.3	24.80	52.5	51.6	47.4	64.3	53.9	24.80
34.5	35.0	33.6	31.7	33.7	27.13	55.7	54.7	48.7	54.4	53.4	27.13
29.0	29.7	29.3	26.8	28.7	28.88	61.6	57.1	51.7	57.6	57.2	28.88
26.5	26.4	25.0	23.4	25.3	37.02	44.4	45.5	38.5	43.9	43.1	37.02

THIS IS THE INPUT DATA FOR THE FOURTEENTH RUN

THIS RUN STARTED APRIL 27, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 21 PPM

C. SILICA : 420 PPM

D. CARBONATE: 840 PPM

E. PH : 6.8

F. ADDITIVE : DOW CORNING B-2083-78

1. LEVEL : 20 PPM

G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	322.0	104.0	5.3	82.0	101.0	499185.
1.017	322.0	104.0	4.9	83.0	102.0	499866.
1.900	323.0	105.0	5.1	85.0	103.0	500440.
3.500	324.0	108.0	5.1	86.0	103.0	501530.
4.730	325.0	108.0	5.1	85.0	103.0	502357.
12.800	323.0	108.5	5.2	75.5	93.0	507834.
20.466	325.0	111.0	4.9	75.0	92.0	512895.
21.867	325.0	112.0	5.1	78.0	94.0	513821.
22.817	324.0	115.0	5.3	81.0	97.0	514443.
24.800	327.0	122.0	5.2	84.0	100.0	515751.
27.133	327.0	125.0	4.9	87.0	101.0	517285.
28.883	326.0	126.0	4.9	87.0	100.0	518455.
37.017	325.5	127.5	5.0	78.5	91.0	523980.

RESULTS FROM THE MAIN EXCHANGER FOR THE FOURTEENTH RUN

THIS RUN STARTED APRIL 27, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 21 PPM

C. SILICA : 420 PPM

D. CARBONATE: 840 PPM

E. PH : 6.8

F. ADDITIVE : DOW CORNING B-2083-78

1. LEVEL : 20 PPM

G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
493.6	5534.8	103642.6	104951.4	178.8	.00
456.3	5372.1	95820.5	101865.4	186.7	1.02
474.7	5628.7	99496.0	101114.6	189.8	1.90
474.5	5555.3	98758.6	94250.6	145.2	3.50
474.3	5607.6	99174.3	100734.1	149.8	4.73
484.0	5465.6	100040.9	95457.1	101.1	12.80
455.7	5473.1	93985.5	92856.2	89.3	20.47
474.3	5419.4	97370.7	86537.5	90.0	21.87
493.1	5456.4	99349.3	87128.6	92.3	22.82
483.1	5436.0	95530.9	86801.6	84.1	24.80
455.2	5526.2	88718.9	77211.9	74.4	27.13
455.4	5615.6	87882.9	72856.3	70.0	28.88
464.8	5547.6	88806.8	69206.8	59.2	37.02

THIS IS THE INPUT DATA FOR THE FIFTEENTH RUN
THIS RUN STARTED MAY 4, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 25 PPM
C. SILICA : 470
D. CARBONATE: 940
E. PH : 6.8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN WAS ATTEMPTED WITH THE PROGRESSIVE ELECTRONIC WATER TREATER

TIME HOURS	FLOWS					COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	EXCH 1 IN OUT		EXCH 2 IN OUT	EXCH 3 IN OUT				
.00	7.4	7.1	7.3	8.2	656439.	94.0	106.0	88.0	94.0	85.0	88.0	

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
310.0	220.0	309.0	210.0	310.0	211.0	310.0	201.0	220.0	158.0	210.0	146.0	211.0	163.0		

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
158.0	131.0	146.0	128.0	163.0	136.0	155.0	130.0

RESULTS FROM THE FIFTEENTH RUN

THIS RUN STARTED MAY 4, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 25 PPM
C. SILICA : 470
D. CARBONATE: 940
E. PH : 6.8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN WAS ATTEMPTED WITH THE PROGRESSIVE ELECTRONIC WATER TREATER

COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS					AVERAGE	TIME HOURS
						TUBE1	TUBE2	TUBE3	TUBE4	BTU/HR. SQ.FT. DEG. F		
.0	173.3	166.3	170.9	192.0	.00	52.4	57.7	58.9	76.0	61.2	.00	

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS						
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
60.6	68.6	46.3	55.4	57.7	.00	43.5	31.7	39.4	46.2	40.2	.00

THIS IS THE INPUT DATA FOR THE FIFTEENTH RUN
THIS RUN STARTED MAY 4, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 25 PPM
C. SILICA : 470
D. CARBONATE: 940
E. PH : 6.8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN WAS ATTEMPTED WITH THE PROGRESSIVE ELECTRONIC WATER TREATER

TIME HOURS	BRINE		BRINE FLOW GAGE	COOLH2O		COOLH2O FLOWRATE GALLONS
	INLET TEMP	OUTLET TEMP		INLET TEMP	OUTLET TEMP	
.000	321.0	109.0	5.3	86.0	102.0	532632.

RESULTS FROM THE MAIN EXCHANGER FOR THE FIFTEENTH RUN
THIS RUN STARTED MAY 4, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 25 PPM
C. SILICA : 470
D. CARBONATE: 940
E. PH : 6.8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN WAS ATTEMPTED WITH THE PROGRESSIVE ELECTRONIC WATER TREATER

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ.FT. DEG.F	RUN TIME HOURS
493.8	.0	100844.1	.0	69.4	.00

THIS IS THE INPUT DATA FOR THE SIXTEENTH RUN

THIS RUN STARTED MAY 5, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 25 PPM

C. SILICA : 405 PPM

D. CARBONATE: 810 PPM

E. PH : 7.0

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3	
.00	7.4	7.1	7.3	8.2	656439.	IN	OUT	IN	OUT	IN	OUT
.97	7.3	7.3	7.4	7.5	657048.	94.0	106.0	88.0	94.0	85.0	88.0
2.17	7.4	7.4	7.4	7.7	657788.	96.0	109.0	90.0	96.0	87.0	90.0
3.70	7.6	7.5	7.6	7.9	658737.	97.0	110.0	91.0	97.0	88.0	91.0
10.12	6.9	6.7	6.7	6.7	662732.	97.0	108.0	91.0	97.0	87.0	91.0
18.90	7.2	7.3	7.0	7.3	668202.	90.0	98.0	83.0	90.0	81.0	83.0
20.02	6.8	6.9	6.6	6.8	668893.	88.0	94.0	83.0	88.0	80.0	83.0
20.95	7.1	7.2	6.8	7.2	669468.	88.0	95.0	84.0	88.0	80.0	84.0
22.28	7.2	7.1	6.7	7.1	670278.	89.0	96.0	84.0	89.0	82.0	84.0
26.18	7.6	7.6	7.4	7.4	672785.	91.0	96.0	85.0	91.0	84.0	85.0
						96.0	101.0	92.0	96.0	89.0	92.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
310.0	220.0	309.0	210.0	310.0	211.0	310.0	201.0	220.0	158.0	210.0	146.0	211.0	163.0	201.0	155.0
313.0	228.0	312.0	217.0	312.0	217.0	312.0	214.0	228.0	168.0	217.0	161.0	217.0	166.0	214.0	166.0
312.0	230.0	311.0	221.0	311.0	221.0	311.0	219.0	230.0	170.0	221.0	166.0	221.0	170.0	219.0	168.0
312.0	231.0	312.0	225.0	312.0	226.0	312.0	224.0	231.0	173.0	225.0	171.0	226.0	173.0	224.0	172.0
312.0	252.0	310.0	249.0	310.0	246.0	310.0	247.0	252.0	194.0	249.0	193.0	246.0	190.0	247.0	193.0
314.0	265.0	312.0	265.0	312.0	262.0	313.0	262.0	265.0	213.0	265.0	214.0	262.0	215.0	262.0	214.0
313.0	264.0	311.0	264.0	312.0	261.0	312.0	262.0	264.0	214.0	264.0	216.0	261.0	216.0	262.0	215.0
315.0	270.0	313.0	270.0	313.0	267.0	314.0	267.0	270.0	220.0	270.0	220.0	267.0	220.0	267.0	220.0
312.0	268.0	310.0	268.0	311.0	265.0	312.0	265.0	268.0	220.0	268.0	221.0	265.0	221.0	265.0	221.0
319.0	273.0	313.0	273.0	313.0	271.0	314.0	271.0	273.0	229.0	273.0	229.0	271.0	229.0	271.0	231.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
158.0	131.0	146.0	128.0	163.0	136.0	155.0	130.0
168.0	138.0	161.0	136.0	166.0	138.0	166.0	137.0
170.0	138.0	166.0	138.0	170.0	143.0	168.0	141.0
173.0	141.0	171.0	140.0	173.0	145.0	172.0	143.0
194.0	159.0	193.0	158.0	190.0	157.0	193.0	159.0
213.0	176.0	214.0	176.0	215.0	181.0	214.0	180.0
214.0	178.0	216.0	180.0	216.0	184.0	215.0	184.0
220.0	184.0	220.0	184.0	220.0	189.0	220.0	189.0
220.0	184.0	221.0	185.0	221.0	190.0	221.0	190.0
229.0	194.0	229.0	195.0	229.0	196.0	231.0	198.0

RESULTS FROM THE SIXTEENTH RUN

THIS RUN STARTED MAY 5, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 25 PPM

C. SILICA : 405 PPM

D. CARBONATE: 810 PPM

E. PH : 7.0

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

MINI EXCHANGER NUMBER 1											
OVERALL HEAT TRANSFER COEFFICIENTS											
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR.	TUBE2 BTU/HR.	TUBE3 SQ.FT.	TUBE4 DEG. F	AVERAGE	TIME HOURS
5200.4	173.3	166.3	170.9	192.0	.00	100.0	110.1	112.4	145.1	116.9	.00
5089.0	170.7	170.8	173.1	175.5	.97	97.6	114.1	115.7	122.4	112.5	.97
5107.6	173.1	173.2	173.2	180.2	2.17	97.7	111.3	111.3	119.3	109.9	2.17
5138.7	177.8	175.5	177.8	184.8	3.70	91.0	98.5	98.3	105.4	98.3	3.70
5150.9	161.4	156.9	156.9	156.9	10.12	57.9	58.0	61.4	60.3	59.4	10.12
5120.5	168.3	170.8	163.8	170.7	18.90	43.7	42.7	43.9	46.6	44.2	18.90
5100.2	159.0	161.5	154.4	159.1	20.02	46.3	45.3	47.3	47.6	46.6	20.02
5027.6	165.9	168.4	159.0	168.3	20.95	44.3	43.2	44.0	47.4	44.7	20.95
5318.7	168.4	166.3	156.8	166.1	22.28	39.1	37.0	38.5	41.6	39.1	22.28
5160.2	177.2	176.5	173.0	174.1	26.18	41.9	36.8	38.1	39.1	39.0	26.18

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
	BTU/HR.	SQ.FT.	DEG. F				BTU/HR.	SQ.FT.	DEG. F		
111.2	126.0	85.4	101.7	106.1	.00	84.6	61.7	76.6	89.8	78.2	.00
98.9	101.1	90.3	87.3	94.4	.97	77.8	69.5	74.7	79.1	75.3	.97
98.4	96.0	86.8	92.2	93.3	2.17	83.4	75.0	67.2	72.2	74.5	2.17
94.9	90.3	88.4	91.4	91.2	3.70	90.0	88.0	76.0	83.8	84.4	3.70
76.0	72.3	74.0	70.2	73.2	10.12	47.7	46.9	45.1	45.3	46.3	10.12
54.9	54.4	48.3	51.6	52.3	18.90	48.9	50.7	42.3	44.5	46.6	18.90
47.4	45.9	41.4	44.6	44.8	20.02	53.2	53.1	44.3	44.4	48.8	20.02
50.8	51.5	46.1	48.8	49.3	20.95	39.4	39.9	31.8	33.6	36.2	20.95
58.2	56.0	49.9	52.9	54.2	22.28	34.4	33.7	26.8	28.3	30.8	22.28
45.6	45.5	42.8	40.7	43.7	26.18	45.9	44.2	41.9	41.4	43.3	26.18

THIS IS THE INPUT DATA FOR THE SIXTEENTH RUN
THIS RUN STARTED MAY 5, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 405 PPM
- D. CARBONATE: 810 PPM
- E. PH : 7.0
- F. ADDITIVE : NONE
- I. LEVEL : NONE
- G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	321.0	109.0	5.3	84.0	102.0	532632.
.967	322.0	108.0	5.2	87.0	103.0	533305.
2.167	321.0	107.0	5.0	88.0	104.0	534125.
3.700	322.0	108.0	4.9	87.0	103.0	535175.
10.117	319.0	104.0	5.3	81.0	97.0	539612.
18.900	321.0	107.0	4.9	80.0	96.0	545710.
20.017	321.0	107.0	5.2	81.0	97.0	546478.
20.950	322.0	109.0	4.8	82.0	98.0	547118.
22.283	320.0	111.0	5.0	84.0	99.0	548024.
26.183	322.0	116.0	4.8	89.0	103.5	550800.

RESULTS FROM THE MAIN EXCHANGER FOR THE SIXTEENTH RUN

THIS RUN STARTED MAY 5, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 405 PPM
- D. CARBONATE: 810 PPM
- E. PH : 7.0
- F. ADDITIVE : NONE
- I. LEVEL : NONE
- G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
493.8	5751.5	100864.1	91839.8	132.6	.00
484.3	5646.0	99846.4	90154.6	143.9	.97
465.9	5658.0	96040.4	90347.4	162.3	2.17
456.3	5713.0	94086.1	91224.8	140.4	3.70
494.3	5743.4	102344.8	91710.9	132.3	10.12
456.5	5688.8	94119.5	90838.3	108.7	18.90
484.5	5674.5	99881.9	90609.8	115.7	20.02
447.0	5421.3	91741.1	89760.4	107.0	20.95
466.1	5885.8	93859.4	88110.8	105.2	22.28
442.3	5732.6	87840.6	82955.9	98.2	26.18

THIS IS THE INPUT DATA FOR THE SEVENTEENTH RUN

THIS RUN STARTED MAY 15, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 24 PPM

C. SILICA : 420 PPM

D. CARBONATE: 840 PPM

E. PH : 6.9

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	7.4	7.4	7.3	7.5	674993.	88.1	101.3	81.7	88.1	78.4	81.7
.40	7.5	7.4	7.5	7.4	675241.	87.7	100.7	81.4	87.7	78.1	81.4
10.36	7.6	7.6	7.7	7.8	681647.	88.0	99.7	80.8	88.0	76.9	80.8
11.70	7.8	7.8	7.9	8.3	682495.	90.8	102.1	83.4	90.8	79.7	83.4
12.96	7.5	7.4	7.5	7.8	683308.	93.4	104.3	85.9	93.4	81.9	85.9
13.88	8.1	8.0	8.1	8.4	683891.	95.0	105.8	87.4	95.0	83.4	87.4
14.88	8.4	8.2	8.3	8.5	684547.	96.5	106.8	88.6	96.5	84.5	88.6
16.03	7.9	7.8	7.8	8.1	685254.	98.5	108.2	90.4	98.5	85.9	90.4
17.38	7.8	7.6	7.7	7.9	686112.	98.9	107.7	90.8	98.9	86.0	90.8
18.13	8.1	7.8	7.9	8.2	686593.	98.3	106.9	90.4	98.3	85.7	90.4
19.03	8.2	7.8	8.0	8.4	687172.	97.1	105.5	89.3	97.1	84.7	89.3
26.50	8.5	8.3	8.1	8.3	691980.	90.1	97.2	82.8	90.1	78.0	82.8

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
310.0	204.0	310.0	201.0	310.0	207.0	310.0	190.0	204.0	160.0	201.0	155.0	207.0	160.0	190.0	155.0
309.0	203.0	310.0	202.0	310.0	205.0	310.0	190.0	203.0	160.0	202.0	155.0	205.0	157.0	190.0	154.0
308.0	214.0	309.0	214.0	309.0	213.0	309.0	212.0	214.0	166.0	214.0	165.0	213.0	163.0	212.0	163.0
310.0	220.0	311.0	220.0	311.0	220.0	310.0	220.0	220.0	172.0	220.0	171.0	220.0	167.0	220.0	168.0
310.0	221.0	310.0	222.0	310.0	210.0	311.0	221.0	221.0	172.0	222.0	170.0	210.0	166.0	221.0	168.0
310.0	225.0	311.0	225.0	311.0	223.0	311.0	225.0	225.0	173.0	225.0	173.0	223.0	169.0	225.0	172.0
312.0	232.0	313.0	232.0	313.0	230.0	313.0	231.0	232.0	178.0	232.0	178.0	230.0	175.0	231.0	177.0
312.0	239.0	312.0	240.0	313.0	237.0	313.0	237.0	239.0	182.0	240.0	182.0	237.0	177.0	237.0	180.8
312.0	244.0	312.0	245.0	312.0	243.0	312.0	243.0	244.0	189.0	245.0	187.0	243.0	184.0	243.0	185.0
312.0	246.0	312.0	246.0	312.0	245.0	312.0	245.0	246.0	191.0	246.0	190.0	245.0	189.0	245.0	190.0
313.0	249.0	313.0	250.0	313.0	249.0	313.0	250.0	249.0	195.0	250.0	194.0	249.0	192.0	250.0	193.0
307.0	257.0	308.0	257.0	309.0	255.0	309.0	254.0	257.0	205.0	257.0	203.0	255.0	201.0	254.0	202.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
160.0	129.0	155.0	128.0	160.0	129.0	155.0	127.0
160.0	128.0	155.0	127.0	157.0	126.0	154.0	127.0
166.0	131.0	165.0	130.0	163.0	129.0	163.0	130.0
172.0	136.0	171.0	135.0	167.0	135.0	168.0	136.0
172.0	137.0	170.0	137.0	166.0	135.0	168.0	137.0
173.0	140.0	173.0	140.0	169.0	139.0	172.0	140.0
178.0	142.0	178.0	143.0	175.0	142.0	177.0	143.0
182.0	146.0	182.0	146.0	177.0	144.0	180.0	146.0
189.0	151.0	187.0	150.0	184.0	146.0	185.0	151.0
191.0	154.0	190.0	152.0	189.0	150.0	190.0	154.0
195.0	157.0	194.0	154.0	192.0	152.0	193.0	157.0
205.0	166.0	203.0	165.0	201.0	165.0	202.0	166.0

RESULTS FROM THE SEVENTEENTH RUN

THIS RUN STARTED MAY 15, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 24 PPM

C. SILICA : 420 PPM

D. CARBONATE: 840 PPM

E. PH : 6.9

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

						MINI EXCHANGER NUMBER 1					
						OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS						HOURS
5124.4	173.3	173.3	170.9	175.6	.00	121.2	126.2	114.8	147.9	127.5	.00
5316.6	175.7	173.3	175.6	173.3	.40	124.0	124.9	121.5	146.3	129.2	.40
5232.2	178.1	178.0	180.4	182.7	10.36	105.9	106.8	109.7	112.7	108.8	10.36
5332.2	182.6	182.6	184.9	194.4	11.70	103.0	103.9	105.2	109.6	105.4	11.70
5234.5	175.6	173.3	175.6	182.6	12.96	98.3	95.5	115.3	103.1	103.0	12.96
5417.1	189.7	187.2	189.6	196.6	13.88	101.3	101.0	105.4	106.0	103.4	13.88
5075.7	196.5	191.7	198.7	198.7	14.88	93.1	91.7	95.8	96.6	94.3	14.88
5245.7	184.8	182.5	182.4	189.4	16.03	83.3	80.9	86.0	89.3	84.9	16.03
5294.0	182.5	177.8	180.1	184.8	17.38	75.9	72.6	76.2	78.2	75.7	17.38
5311.3	189.5	182.5	184.8	191.8	18.13	74.7	72.0	74.2	77.0	74.5	18.13
5315.3	191.7	182.4	187.1	196.4	19.03	72.3	67.5	70.5	72.7	70.7	19.03
5302.5	199.3	194.5	189.8	194.4	26.50	55.5	55.1	57.1	59.8	56.9	26.50

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	SQ.FT.	DEG. F		HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS
90.8	99.4	94.4	80.7	91.3	.00	83.9	76.4	82.8	81.1	81.0	.00
90.1	100.7	101.6	82.2	93.6	.40	89.1	80.3	89.8	78.0	84.3	.40
92.2	94.6	99.4	99.1	96.3	10.36	90.1	91.4	91.9	89.6	90.7	10.36
90.7	93.1	104.3	107.0	98.8	11.70	88.8	90.0	83.1	86.0	87.0	11.70
94.2	99.4	91.7	108.4	98.4	12.96	91.6	86.3	85.8	86.5	87.5	12.96
102.2	100.9	109.5	108.6	105.3	13.88	91.2	90.0	85.7	92.2	89.8	13.88
101.4	98.9	104.5	103.5	102.1	14.88	93.8	88.2	86.4	89.3	89.4	14.88
100.0	100.1	107.5	104.3	103.0	16.03	92.5	91.3	87.6	90.6	90.5	16.03
92.2	95.4	100.5	100.9	97.3	17.38	91.2	88.1	96.2	84.4	90.0	17.38
92.9	91.5	93.5	94.8	93.2	18.13	85.9	86.7	91.9	85.1	87.4	18.13
87.3	86.2	91.2	94.9	89.9	19.03	82.3	84.6	88.9	80.7	84.1	19.03
75.9	77.6	76.8	75.7	76.5	26.50	75.7	73.0	68.0	69.0	71.4	26.50

THIS IS THE INPUT DATA FOR THE SEVENTEENTH RUN

THIS RUN STARTED MAY 15, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 24 PPM

C. SILICA : 420 PPM

D. CARBONATE: 840 PPM

E. PH : 6.9

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	319.0	100.0	5.0	79.1	96.5	637887.
.400	319.0	102.0	5.0	78.8	96.2	658168.
10.360	318.0	102.0	4.9	77.7	94.8	665418.
11.700	318.0	102.0	4.7	80.5	97.6	666381.
12.960	318.0	105.0	5.3	82.7	99.8	667310.
13.880	319.0	107.0	4.8	84.2	101.3	667960.
14.880	320.0	107.0	4.9	85.4	101.9	668701.
16.030	319.0	108.0	5.2	86.8	103.2	669498.
17.380	319.0	109.0	5.2	86.9	103.3	670470.
18.130	319.0	109.0	4.8	86.6	102.9	671015.
19.030	320.0	110.0	4.7	85.5	102.0	671670.
26.500	314.0	107.5	4.9	78.7	94.3	677110.

RESULTS FROM THE MAIN EXCHANGER FOR THE SEVENTEENTH RUN

THIS RUN STARTED MAY 15, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 24 PPM

C. SILICA : 420 PPM

D. CARBONATE: 840 PPM

E. PH : 6.9

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

BRINE	COOLH2O	BRINE	COOLH2O	OVERALL	RUN
FLOW	FLOW	FLUX	FLUX	HTC	TIME
LB/HR	LB/HR	BTU/HR	BTU/HR	BTU/HR SQ FT DEG F	HOURS
466.3	5811.9	98323.1	100924.1	163.8	.00
466.3	6022.5	97437.6	104581.1	145.0	.40
457.2	5947.5	95088.6	101499.6	132.4	10.36
438.5	6098.4	91207.4	104074.7	152.4	11.70
494.5	5841.3	101441.6	99486.1	151.1	12.96
447.6	6124.5	91413.6	104519.4	143.7	13.88
456.8	5727.4	93718.9	94313.8	142.1	14.88
485.0	5948.6	98570.5	97362.5	151.7	16.03
485.0	6003.6	98109.4	98262.6	145.0	17.38
447.6	6013.3	90562.6	97821.1	136.2	18.13
438.1	6018.2	88644.4	99102.4	124.5	19.03
458.1	6003.9	91089.9	93473.8	103.8	26.50

THIS IS THE INPUT DATA FOR THE EIGHTEENTH RUN
 THIS RUN STARTED MAY 23, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 20 PPM
 C. SILICA : 420 PPM
 D. CARBONATE: 840 PPM
 E. PH : 6.8
 F. ADDITIVE : SODIUM SULFATE
 1. LEVEL : 23.3 PPM
 G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.4	7.3	7.6	7.7	698076.	94.4	107.3	87.6	94.4	84.0	87.6
.48	8.0	7.8	8.1	7.6	698377.	95.6	108.7	88.4	95.6	84.5	88.4
2.90	9.1	8.7	9.0	5.7	699935.	93.8	104.5	86.6	93.8	81.8	86.6
15.73	8.9	8.6	9.1	6.6	708012.	87.1	94.4	81.3	87.1	77.1	81.3
16.15	8.2	8.0	8.4	8.2	708275.	87.7	95.0	81.9	87.7	77.6	81.9
16.97	8.2	8.0	8.3	8.0	708780.	89.1	96.5	83.3	89.1	79.1	83.3
18.03	8.4	8.1	7.7	8.5	709445.	91.2	98.4	85.4	91.2	81.2	85.4
18.90	8.4	8.2	8.6	8.3	709982.	92.3	99.1	86.7	92.3	82.8	86.7

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
317.0	213.0	317.0	214.0	317.0	219.0	317.0	212.0
319.0	219.0	319.0	219.0	319.0	216.0	319.0	213.0
317.0	240.0	316.0	239.0	313.0	234.0	317.0	237.0
302.0	249.0	300.0	249.0	300.0	238.0	301.0	246.0
302.0	248.0	300.0	247.0	300.0	247.0	300.0	246.0
303.0	250.0	301.0	249.0	301.0	247.0	301.0	247.0
302.0	251.0	301.0	252.0	301.0	248.0	301.0	250.0
302.0	252.0	300.0	252.0	300.0	251.0	300.0	250.0

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
213.0	163.0	214.0	158.0	219.0	166.0	212.0	160.0
219.0	166.0	219.0	165.0	216.0	164.0	213.0	160.0
240.0	193.0	239.0	190.0	234.0	179.0	237.0	185.0
249.0	209.0	249.0	208.0	238.0	198.0	246.0	207.0
248.0	206.0	247.0	205.0	247.0	206.0	246.0	205.0
250.0	208.0	249.0	206.0	247.0	206.0	247.0	206.0
251.0	210.0	252.0	210.0	248.0	208.0	250.0	210.0
252.0	213.0	252.0	212.0	251.0	212.0	250.0	212.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
163.0	138.0	158.0	134.0	166.0	140.0	160.0	135.0
166.0	141.0	165.0	137.0	164.0	139.0	160.0	137.0
193.0	156.5	190.0	153.0	179.0	143.0	185.0	150.0
209.0	178.0	208.0	174.0	198.0	164.0	207.0	175.0
206.0	175.0	205.0	172.0	206.0	173.0	205.0	173.0
208.0	178.0	206.0	173.0	206.0	174.0	206.0	175.0
210.0	181.0	210.0	178.0	208.0	175.0	210.0	178.0
213.0	183.0	212.0	180.0	212.0	180.0	212.0	180.0

RESULTS FROM THE EIGHTEENTH RUN
 THIS RUN STARTED MAY 23, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 20 PPM
 C. SILICA : 420 PPM
 D. CARBONATE: 840 PPM
 E. PH : 6.8
 F. ADDITIVE : SODIUM SULFATE
 1. LEVEL : 23.3 PPM
 G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE
5178.8	172.7	170.4	177.4	179.7	.00	119.4	116.2	112.9	126.0	118.6
5313.0	186.5	181.9	188.9	177.2	.48	121.3	118.3	128.0	125.1	123.2
5198.7	212.4	203.1	210.4	133.0	2.90	97.7	94.0	102.3	64.2	89.5
5220.1	209.2	202.3	214.1	155.2	15.73	61.7	57.7	76.7	48.0	61.0
5115.3	192.7	188.2	197.6	192.9	16.15	59.0	56.9	59.8	59.7	58.8
5160.9	192.7	188.1	195.2	188.1	16.97	58.9	56.8	61.6	59.4	59.2
5122.3	197.4	190.5	181.1	199.9	18.03	58.7	54.4	56.6	59.8	57.4
5208.9	197.4	192.9	202.3	195.3	18.90	56.8	53.6	57.5	56.8	56.2

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS				
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F
96.2	109.5	100.2	106.7	103.2	75.2	76.6	77.3	82.2	77.8
108.2	108.1	110.2	109.7	109.0	80.3	91.6	83.9	75.9	82.9
85.3	86.6	108.3	62.1	85.6	89.2	89.8	103.3	58.3	85.2
61.8	61.5	68.4	45.5	59.3	57.0	61.9	72.0	44.7	58.9
59.6	58.6	59.9	58.9	59.2	55.1	58.3	60.7	57.7	58.0
59.7	60.4	60.1	57.9	59.5	53.2	59.1	59.1	54.9	56.6
60.2	59.3	54.9	59.7	58.6	52.2	56.4	56.6	59.2	56.1
57.0	57.3	58.8	55.5	57.1	51.5	54.7	57.3	55.3	54.7

THIS IS THE INPUT DATA FOR THE EIGHTEENTH RUN
THIS RUN STARTED MAY 23, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.8
F. ADDITIVE : SODIUM SULFATE
1. LEVEL : 23.3 PPM
G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	325.0	107.0	5.0	84.8	102.3	684170.
.483	325.0	109.0	4.8	85.3	103.0	684515.
2.900	322.0	108.0	5.3	82.6	98.5	686284.
15.733	305.0	114.0	4.9	77.8	92.0	695491.
16.150	306.0	115.0	5.2	78.3	92.5	695793.
16.967	306.0	117.0	5.2	79.8	94.3	696374.
18.033	305.0	119.0	5.0	82.0	96.4	697134.
18.900	305.0	121.0	4.8	83.6	97.3	697747.

RESULTS FROM THE MAIN EXCHANGER FOR THE EIGHTEENTH RUN

THIS RUN STARTED MAY 23, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.8
F. ADDITIVE : SODIUM SULFATE
1. LEVEL : 23.3 PPM
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR-SQ-FT-DEG-F	RUN TIME HOURS
465.0	5902.5	97471.6	103087.4	152.7	.00
446.4	6047.2	92916.2	106821.7	142.3	.48
493.6	5933.2	101766.6	94148.4	121.1	2.90
460.1	5997.0	84603.6	84987.4	81.5	15.73
488.0	5888.0	89751.8	83442.6	82.4	16.15
488.0	5900.8	88023.1	85390.7	83.1	16.97
469.4	5849.6	84096.8	84065.4	81.1	18.03
450.7	5942.1	79874.9	81244.3	76.5	18.90

THIS IS THE INPUT DATA FOR THE NINETEENTH RUN

THIS RUN STARTED MAY 31, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 23 PPM
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 10.2
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3	
						IN	OUT	IN	OUT	IN	OUT
.00	7.0	6.9	7.0	7.1	717427.	98.5	111.0	92.5	98.5	89.4	92.5
1.37	7.6	7.4	7.8	7.4	718319.	100.4	113.5	94.0	100.4	90.6	94.0
2.60	7.4	7.2	7.5	7.4	719127.	100.3	113.7	94.2	100.3	90.7	94.2
3.60	7.3	7.1	7.4	7.2	719778.	100.2	113.1	93.9	100.2	90.5	93.9
19.33	7.8	7.7	8.1	8.0	730185.	92.0	105.0	85.5	92.0	82.0	85.5
20.40	7.6	7.6	7.8	7.7	730887.	93.8	106.4	87.4	93.8	83.9	87.4
21.67	7.7	7.3	7.8	7.6	731732.	95.3	107.8	89.0	95.3	85.6	89.0
24.02	7.4	7.1	7.5	7.7	733260.	100.3	112.6	94.0	100.3	90.8	94.0
25.48	7.1	7.1	7.4	7.2	734218.	90.9	103.1	84.4	90.9	81.0	84.4
26.55	7.2	7.1	7.2	7.3	734917.	92.6	104.9	86.1	92.6	82.1	86.1
27.58	7.2	7.2	7.5	7.5	735598.	96.8	109.1	90.5	96.8	87.2	90.5
43.15	7.1	6.8	7.1	7.2	745771.	91.0	103.2	84.5	91.0	81.1	84.5
44.10	7.1	6.9	7.5	7.8	746385.	92.2	104.6	85.7	92.2	82.4	85.7

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
311.0	219.0	316.0	216.0	316.0	208.0	316.0	217.0
320.0	221.0	320.0	221.0	320.0	221.0	320.0	221.0
320.0	224.0	320.0	222.0	319.0	215.0	320.0	223.0
317.0	218.0	317.0	218.0	317.0	212.0	317.0	218.0
319.0	226.0	315.0	222.0	315.0	216.0	315.0	216.0
316.0	222.0	313.0	219.0	314.0	214.0	314.0	214.0
315.0	223.0	310.0	220.0	310.0	214.0	310.0	214.0
317.0	225.0	312.0	221.0	313.0	217.0	313.0	217.0
308.0	215.0	306.0	215.0	306.0	208.0	306.0	210.0
309.0	220.0	308.0	216.0	309.0	213.0	309.0	213.0
317.0	225.0	310.0	220.0	310.0	217.0	310.0	217.0
300.0	223.0	302.0	218.0	302.0	213.0	304.0	213.0
300.0	223.0	304.0	221.0	304.0	218.0	304.0	218.0

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
219.0	163.0	216.0	156.0	208.0	162.0	217.0	166.0
221.0	168.0	221.0	160.0	221.0	166.0	221.0	172.0
224.0	170.0	222.0	162.0	215.0	169.0	223.0	173.0
218.0	166.0	218.0	160.0	212.0	166.0	218.0	168.0
226.0	170.0	222.0	162.0	216.0	165.0	216.0	166.0
222.0	168.0	219.0	162.0	214.0	165.0	214.0	167.0
223.0	169.0	220.0	163.0	214.0	165.0	214.0	167.0
225.0	170.0	221.0	163.0	217.0	166.0	217.0	167.0
215.0	164.0	213.0	156.0	208.0	160.0	210.0	162.0
220.0	166.0	216.0	157.0	213.0	160.0	213.0	162.0
225.0	171.0	220.0	164.0	217.0	166.0	217.0	166.0
223.0	167.0	218.0	160.0	213.0	160.0	213.0	160.0
223.0	170.0	221.0	163.0	218.0	163.0	218.0	163.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
163.0	138.0	156.0	134.0	162.0	138.0	166.0	137.0
168.0	141.0	160.0	137.0	166.0	142.0	172.0	142.0
170.0	141.0	162.0	139.0	169.0	141.0	173.0	141.0
166.0	139.0	160.0	139.0	166.0	141.0	168.0	141.0
170.0	140.0	162.0	138.0	165.0	140.0	166.0	140.0
168.0	140.0	162.0	138.0	165.0	136.0	167.0	136.0
169.0	141.0	163.0	139.0	165.0	142.0	167.0	142.0
170.0	143.0	163.0	141.0	166.0	145.0	167.0	143.0
164.0	139.0	156.0	134.0	160.0	140.0	162.0	139.0
166.0	139.0	157.0	136.0	160.0	140.0	162.0	139.0
171.0	143.0	164.0	140.0	166.0	145.0	166.0	144.0
167.0	140.0	160.0	139.0	160.0	140.0	160.0	140.0
170.0	142.0	163.0	140.0	163.0	143.0	163.0	142.0

RESULTS FROM THE NINETEENTH RUN
THIS RUN STARTED MAY 31, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 23 PPM
- C. SILICA : NONE
- D. CARBONATE: NONE
- E. PH : 10.2
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1				
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	OVERALL HEAT TRANSFER COEFFICIENTS			
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	TUBE1	TUBE2	TUBE3	TUBE4
5386.7	163.8	161.1	163.4	165.8	.00	107.3	114.6	129.9	116.3
5398.7	177.1	172.4	181.8	172.4	1.37	121.8	118.6	125.0	118.6
5367.3	172.4	167.8	174.9	172.4	2.60	116.2	116.3	132.7	117.9
5454.3	170.4	165.7	172.7	168.0	3.60	120.4	117.1	132.7	118.7
5433.8	181.9	179.9	189.2	186.9	19.33	108.5	109.9	125.9	124.4
5506.6	177.4	177.7	182.3	180.0	20.40	110.5	112.7	125.1	123.5
5369.4	179.9	170.9	182.6	178.0	21.67	111.1	105.8	123.4	120.3
5385.3	172.7	166.1	175.4	180.0	24.02	109.2	106.8	120.6	123.8
5412.6	166.4	166.6	173.6	168.9	25.48	106.9	108.4	121.5	114.8
5444.9	168.7	166.4	168.7	171.0	26.55	104.5	108.4	115.8	117.4
5392.9	168.0	168.6	175.6	175.6	27.58	105.5	107.3	116.9	116.9
5339.8	167.1	159.8	166.9	169.1	43.15	93.4	98.9	111.5	114.9
5423.7	167.1	162.0	176.1	183.2	44.10	95.2	99.3	113.1	117.7
									AVERAGE
									117.0
									121.0
									120.8
									122.2
									117.2
									117.9
									115.2
									115.1
									112.9
									111.5
									111.7
									104.7
									106.3

MINI EXCHANGER NUMBER 2					MINI EXCHANGER NUMBER 3				
OVERALL HEAT TRANSFER COEFFICIENTS					OVERALL HEAT TRANSFER COEFFICIENTS				
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4
					HOURS				
103.3	115.9	89.5	94.1	100.7	.00	76.0	72.4	73.3	88.2
101.8	120.5	109.8	89.3	105.3	1.37	84.4	77.3	77.3	88.0
98.8	113.7	89.3	90.2	98.0	2.60	86.0	71.7	84.7	93.0
103.0	116.5	94.9	96.4	102.7	3.60	87.7	69.4	80.7	83.6
97.1	109.6	98.6	94.9	100.0	19.33	83.0	70.3	74.2	75.8
99.0	110.0	97.2	90.9	99.3	20.40	77.8	70.7	87.5	91.1
99.4	104.8	97.5	89.9	97.9	21.67	82.4	71.1	69.9	73.1
100.6	108.8	100.7	100.7	102.7	24.02	81.8	68.7	65.2	77.4
93.1	110.6	96.6	92.0	98.1	25.48	72.9	70.9	62.0	69.0
95.7	111.1	100.5	96.7	101.0	26.55	88.2	73.8	67.4	78.2
93.0	103.2	97.9	97.9	98.0	27.58	79.0	73.1	62.8	66.4
94.3	99.5	96.9	98.2	97.2	43.15	78.2	61.4	60.5	61.3
87.6	97.7	101.9	106.0	98.3	44.10	75.8	64.2	59.1	65.1
									AVERAGE
									77.5
									81.7
									83.8
									80.3
									75.8
									81.8
									74.1
									73.3
									68.7
									67.9
									70.3
									65.4
									66.0

THIS IS THE INPUT DATA FOR THE NINETEENTH RUN
THIS RUN STARTED MAY 31, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 23 PPM
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 10.2
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	327.0	110.0	5.4	90.4	109.3	705188.
1.366	328.0	113.0	4.8	91.6	109.5	706096.
2.600	328.0	113.0	5.2	91.7	109.6	706917.
3.600	325.0	113.0	5.1	91.6	109.4	707580.
19.333	322.0	105.0	4.7	82.9	100.0	718177.
20.400	320.0	107.0	4.9	84.1	101.9	718892.
21.667	317.0	110.0	4.8	86.5	103.9	719755.
24.016	319.0	116.0	4.8	91.1	109.4	721324.
25.483	313.0	111.0	5.3	81.9	99.2	722305.
26.550	316.0	110.0	5.3	83.5	101.2	723022.
27.583	318.0	114.0	5.1	88.1	105.5	723715.
43.150	310.0	116.0	5.3	82.0	100.0	734150.
44.100	310.0	116.0	4.8	83.3	100.9	734778.

RESULTS FROM THE MAIN EXCHANGER FOR THE NINETEENTH RUN
THIS RUN STARTED MAY 31, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 23 PPM
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 10.2
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
501.7	5485.2	104933.0	103462.8	244.1	.00
445.7	5489.9	92392.7	98073.3	158.6	1.37
482.8	5470.7	100092.1	97730.1	166.0	2.40
474.3	5558.0	96919.6	98734.8	163.4	3.40
437.7	5540.0	91493.6	94543.8	139.5	19.33
454.8	5629.0	93718.9	99995.3	146.3	20.40
448.1	5517.8	89349.2	95817.8	135.2	21.47
447.6	5518.1	87582.5	100778.9	135.9	24.02
495.7	5556.3	96440.4	95932.4	114.3	25.48
495.0	5545.0	98220.9	97949.4	127.6	26.55
475.9	5535.7	93542.1	96128.9	125.7	27.58
496.4	5465.1	92766.1	98174.5	103.6	43.15
449.6	5546.2	84014.5	97417.3	100.7	44.10

THIS IS THE INPUT DATA FOR THE TWENTIETH RUN
 THIS RUN STARTED JUNE 9, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 20 PP
 C. SILICA : 410 PPM
 D. CARBONATE: 820 PPM
 E. PH : 6.9
 F. ADDITIVE : CALGON CL-163
 1. LEVEL : 13 PPM
 G. OTHER :

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1	TUBE 2	TUBE 3	TUBE 4		EXCH 1		EXCH 2		EXCH 3	
	GAGE	GAGE	GAGE	GAGE		IN	OUT	IN	OUT	IN	OUT
.00	7.7	7.6	7.4	7.4	750859.	100.3	111.6	93.7	100.3	90.2	93.7
.68	7.9	8.0	7.9	8.0	751284.	101.2	112.4	94.1	101.2	90.2	94.1
1.18	8.1	8.2	8.2	8.2	751584.	100.9	112.3	93.5	100.9	89.4	93.5
4.68	8.3	8.3	8.1	9.3	754070.	95.6	107.2	88.2	95.6	84.2	88.2
14.25	8.5	8.6	8.3	8.6	759700.	93.9	104.2	86.9	93.9	83.2	86.9
16.08	9.2	9.3	8.9	8.8	760846.	97.7	107.6	90.6	97.7	86.8	90.6
16.91	9.2	9.3	8.9	8.8	761380.	98.7	108.5	91.3	98.7	87.1	91.3
17.76	8.8	8.9	8.6	8.6	761906.	98.0	107.5	90.8	98.0	86.5	90.8
18.81	9.5	9.6	9.2	9.1	762560.	101.1	110.3	94.2	101.1	90.0	94.2
20.06	9.3	9.3	9.2	9.1	763328.	101.9	110.7	94.7	101.9	90.2	94.7
21.18	9.1	9.3	9.1	9.2	764033.	99.8	108.6	92.9	99.8	88.2	92.9
21.79	9.3	9.6	9.5	9.4	764415.	100.9	109.7	94.0	100.9	89.4	94.0
22.68	10.0	10.0	10.0	10.0	764960.	102.7	111.1	95.9	102.7	91.2	95.9
27.39	9.5	9.8	9.4	9.4	767927.	96.5	104.7	89.9	96.5	84.6	89.9
32.83	9.8	10.0	10.0	9.8	771333.	95.1	102.5	88.5	95.1	83.3	88.5
41.66	10.0	10.0	8.3	8.8	776890.	100.0	106.6	94.0	100.0	89.2	94.0
52.63	9.6	10.0	6.9	7.5	783667.	93.5	99.8	87.7	93.5	82.8	87.7

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
304.0	216.0	304.0	222.0	304.0	213.0	304.0	219.0	216.0	171.0	222.0	165.0	213.0	167.0	219.0	169.0
306.0	218.0	307.0	227.0	307.0	217.0	307.0	225.0	218.0	173.0	227.0	169.0	217.0	172.0	225.0	173.0
307.0	220.0	307.0	229.0	307.0	220.0	307.0	226.0	220.0	174.0	229.0	174.0	220.0	174.0	226.0	174.0
305.0	218.0	304.0	224.0	304.0	222.0	304.0	221.0	218.0	171.0	224.0	170.5	222.0	171.5	221.0	169.0
298.0	218.0	298.0	220.0	298.0	221.0	298.0	216.0	218.0	171.0	220.0	171.0	221.0	171.0	216.0	169.0
296.0	220.0	296.0	222.0	296.0	222.0	296.0	218.0	220.0	174.0	222.0	174.0	222.0	174.0	218.0	172.0
296.0	223.0	296.0	225.0	296.0	225.0	296.0	220.0	223.0	175.0	225.0	175.0	225.0	175.0	220.0	175.0
296.0	224.0	296.0	226.0	296.0	226.0	296.0	222.0	224.0	177.0	226.0	177.0	226.0	177.0	222.0	176.0
297.0	229.0	297.0	231.0	297.0	231.0	297.0	228.0	229.0	182.0	231.0	182.0	231.0	182.0	228.0	182.0
298.0	229.0	297.0	233.0	297.0	233.0	297.0	231.0	229.0	183.0	233.0	184.0	233.0	184.0	231.0	184.0
299.0	231.0	298.0	234.0	298.0	234.0	297.0	232.0	231.0	183.0	234.0	184.0	234.0	186.0	232.0	187.0
299.0	234.0	299.0	236.0	298.0	236.0	298.0	235.0	234.0	187.0	236.0	188.0	236.0	188.0	235.0	189.0
298.0	235.0	299.0	237.0	298.0	237.0	298.0	237.0	235.0	189.0	237.0	190.0	237.0	190.0	237.0	190.0
299.0	239.0	299.0	240.0	299.0	240.0	299.0	240.0	239.0	192.0	240.0	193.0	240.0	196.0	240.0	196.0
296.0	240.0	296.0	241.0	296.0	241.0	296.0	240.0	240.0	196.0	241.0	202.0	241.0	202.0	240.0	200.0
295.0	242.0	294.0	245.0	294.0	244.0	294.0	238.0	242.0	200.5	245.0	209.0	244.0	203.5	238.0	197.5
273.0	243.0	265.0	243.0	285.0	237.0	285.0	226.0	243.0	202.0	243.0	209.0	237.0	207.0	226.0	205.5

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
171.0	146.0	165.0	143.0	167.0	140.0	169.0	140.0
173.0	147.0	169.0	146.0	172.0	145.0	173.0	145.0
174.0	147.0	174.0	147.0	174.0	146.0	174.0	145.0
171.0	143.5	170.5	142.0	171.5	144.0	169.0	140.0
171.0	143.0	171.0	143.0	171.0	140.0	169.0	140.0
174.0	146.0	174.0	146.0	174.0	146.0	172.0	142.0
175.0	147.0	175.0	148.0	175.0	143.0	175.0	144.0
177.0	148.0	177.0	149.0	177.0	144.0	176.0	144.0
182.0	152.0	182.0	153.0	182.0	148.0	182.0	148.0
183.0	153.0	184.0	157.0	184.0	154.0	184.0	153.0
183.0	153.0	184.0	156.0	186.0	151.0	187.0	152.0
187.0	155.0	188.0	156.0	188.0	158.0	189.0	156.0
189.0	157.0	190.0	160.0	190.0	154.0	190.0	155.0
192.0	158.0	193.0	162.0	196.0	160.0	196.0	160.0
196.0	162.0	202.0	165.0	202.0	168.0	200.0	164.0
200.5	166.0	209.0	172.0	203.5	168.5	197.5	164.0
202.0	165.0	209.0	172.0	207.0	164.0	205.5	155.5

RESULTS FROM THE TWENTIETH RUN

THIS RUN STARTED JUNE 9, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PP
- C. SILICA : 410 PPM
- D. CARBONATE: 820 PPM
- E. PH : 6.9
- F. ADDITIVE : CALGON CL-165
- 1. LEVEL : 13 PPM
- G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	DEG. F	HOURS
5132.5	180.8	178.5	173.8	173.8	.00	112.7	101.2	113.5	103.4	107.7	.00
4948.1	185.3	187.6	185.3	187.6	.68	110.2	97.6	112.9	100.8	105.4	.68
5857.7	189.9	192.3	192.3	192.3	1.18	120.5	105.6	122.0	111.0	114.8	1.18
4858.2	193.6	194.9	191.4	217.2	4.68	108.7	98.6	100.0	115.3	105.7	4.68
5164.5	200.2	202.5	195.5	202.5	14.25	102.8	100.6	95.5	107.4	101.6	14.25
5310.9	216.9	219.2	209.8	207.4	16.08	106.8	104.3	99.8	105.6	104.1	16.08
5107.3	216.9	219.2	209.8	207.4	16.91	101.4	99.0	94.7	102.2	99.3	16.91
5141.6	207.4	209.8	202.7	202.7	17.76	96.0	93.7	90.6	97.2	94.4	17.76
5069.0	226.8	226.2	216.8	214.4	18.81	95.3	92.8	88.9	93.0	92.5	18.81
5211.5	219.0	219.1	216.8	214.4	20.06	95.5	87.6	86.6	89.0	89.7	20.06
5118.0	214.2	219.0	214.3	216.8	21.18	89.7	85.6	83.8	86.9	86.5	21.18
5092.8	218.9	226.0	223.7	221.4	21.79	87.2	86.6	84.6	85.4	85.9	21.79
5169.7	235.5	235.4	235.5	235.5	22.68	89.3	87.0	85.9	85.9	87.0	22.68
5178.0	223.6	230.7	221.3	221.3	27.39	78.5	79.4	76.2	76.2	77.6	27.39
5198.5	231.0	235.7	235.7	231.0	32.83	72.8	72.7	72.7	72.8	72.8	32.83
5102.5	235.8	236.0	194.7	206.5	41.66	72.0	66.1	55.8	67.7	65.4	41.66
5154.2	227.6	237.0	162.3	177.7	52.63	44.2	62.4	49.8	69.6	56.5	52.63

MINI EXCHANGER NUMBER 2					MINI EXCHANGER NUMBER 3						
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	DEG. F	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	DEG. F	HOURS
91.4	115.8	93.4	97.6	99.6	.00	73.6	68.5	83.0	88.0	78.3	.00
91.1	117.4	92.1	103.5	101.0	.68	77.3	71.7	82.2	85.7	79.2	.68
103.1	120.3	104.4	115.1	110.7	1.18	86.4	87.4	91.5	95.6	90.2	1.18
92.1	103.6	96.0	114.3	101.5	4.68	76.2	80.8	74.8	94.1	81.5	4.68
96.2	100.7	98.7	99.3	98.7	14.25	77.4	78.3	85.8	84.2	81.4	14.25
103.5	108.3	103.6	101.0	104.1	16.08	84.9	85.8	82.1	91.3	86.0	16.08
105.7	110.4	105.6	96.0	104.4	16.91	85.4	82.6	97.7	92.8	89.6	16.91
98.1	102.6	99.2	95.2	98.8	17.76	83.6	81.0	96.1	93.7	88.6	17.76
98.0	102.5	96.2	92.3	97.7	18.81	86.1	83.5	97.7	96.6	91.0	18.81
97.8	102.0	100.9	96.5	99.3	20.06	90.9	78.9	88.8	91.4	87.5	20.06
94.6	99.1	92.1	87.5	93.3	21.18	84.6	78.5	98.6	98.5	90.1	21.18
91.5	95.3	94.3	89.3	92.6	21.79	88.2	89.9	82.2	90.3	87.7	21.79
94.8	95.6	95.6	95.6	95.4	22.68	92.1	83.9	105.4	101.7	95.8	22.68
86.3	88.3	78.2	78.2	82.7	27.39	89.6	81.7	90.8	90.8	88.2	27.39
83.8	73.5	73.5	74.8	76.4	32.83	83.6	88.7	80.1	85.9	84.6	32.83
81.0	67.0	63.9	71.2	70.7	41.66	87.1	86.6	70.8	76.1	80.1	41.66
83.0	69.6	43.3	33.9	57.5	52.63	82.3	79.9	67.2	90.8	80.0	52.63

THIS IS THE INPUT DATA FOR THE TWENTIETH RUN

THIS RUN STARTED JUNE 9, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PP
- C. SILICA : 410 PPM
- D. CARBONATE: 820 PPM
- E. PH : 6.9
- F. ADDITIVE : CALGON CL-165
- 1. LEVEL : 13 PPM
- G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	310.0	111.0	5.1	91.0	107.8	748915.
.683	311.0	113.0	4.8	91.2	107.8	749375.
1.183	311.0	113.0	4.6	90.5	106.7	749700.
4.683	308.5	105.5	5.1	85.1	100.9	752784.
14.250	303.0	108.0	4.8	84.0	100.1	758428.
16.083	300.0	110.0	4.8	87.7	103.3	759658.
16.913	299.0	111.0	4.9	88.1	103.6	760231.
17.763	299.0	111.0	5.1	87.5	102.9	760796.
18.813	301.0	113.0	4.9	90.9	105.6	761501.
20.063	300.0	114.0	5.0	91.2	105.6	762329.
21.179	301.0	113.0	5.1	89.2	103.7	763087.
21.795	300.0	113.0	4.7	90.3	104.3	763498.
22.678	300.0	114.0	4.8	92.2	106.1	764087.
27.394	301.0	111.0	4.7	85.5	99.1	767283.
32.827	296.0	110.0	4.5	84.2	96.9	770945.
41.660	294.0	118.0	5.0	90.2	104.2	776905.
52.626	285.0	115.0	5.3	83.6	97.4	784210.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTIETH RUN
 THIS RUN STARTED JUNE 9, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 20 PP
 C. SILICA : 410 PPM
 D. CARBONATE: 820 PPM
 E. PH : 6.9
 F. ADDITIVE : CALGON CL-165
 1. LEVEL : 13 PPM
 G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HRSQFTDEGF	RUN TIME HOURS
477.7	5559.4	91537.3	93210.4	146.7	.00
449.4	5365.4	85694.9	88887.3	138.0	.68
430.6	7274.9	82124.3	117618.3	148.9	1.18
478.0	4876.4	93403.1	76892.7	137.2	4.68
451.1	5547.5	84650.9	89136.8	121.6	14.25
451.7	5703.7	82593.3	88799.3	128.8	16.08
461.4	5491.3	83466.3	84945.6	123.4	16.91
480.2	5547.7	86873.1	85263.4	122.4	17.76
460.9	5470.1	83407.7	80250.3	120.0	18.81
470.6	5609.0	84244.8	80607.9	116.6	20.06
479.7	5512.0	86812.1	79763.6	112.9	21.18
442.3	5510.0	79410.7	76985.1	109.0	21.79
451.7	5595.9	80874.9	77627.1	114.5	22.68
442.1	5573.4	80844.3	75646.9	96.4	27.39
424.3	5581.8	75926.6	70746.6	88.3	32.83
471.9	5502.7	79933.5	76883.1	95.7	41.66
497.6	5547.6	81354.4	76403.4	89.1	52.63

THIS IS THE INPUT DATA FOR THE TWENTY FIRST RUN
 THIS RUN STARTED JUNE 21, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 20 PPM
 C. SILICA : 425 PPM
 D. CARBONATE: 850 PPM
 E. PH : 6.9
 F. ADDITIVE : AMMONIUM BIFLOURIDE
 1. LEVEL : 32 PPM
 G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F							
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.4	7.2	7.2	7.6	829421.	96.2	108.8	89.9	96.2	86.5	89.9		
.90	7.7	7.5	7.6	7.6	829985.	98.1	111.0	91.9	98.1	88.2	91.9		
1.83	8.3	8.2	8.2	8.1	830611.	100.6	111.6	93.2	100.6	89.0	93.2		
2.95	8.8	8.5	8.5	8.2	831290.	100.8	110.5	93.5	100.8	88.6	93.5		
4.02	8.5	8.1	8.2	8.2	831963.	100.4	109.3	94.0	100.4	89.3	94.0		
4.90	8.7	8.5	8.5	8.4	832520.	101.6	110.3	95.2	101.6	90.2	95.2		
6.20	8.9	8.6	8.5	8.3	833352.	101.8	109.9	96.1	101.8	91.7	96.1		
6.98	8.7	8.6	8.6	8.1	833850.	102.2	110.1	96.5	102.2	91.7	96.5		
13.97	8.0	7.8	7.5	8.4	838315.	92.3	98.0	88.2	92.3	84.8	88.2		
22.02	7.8	7.9	7.7	7.9	843405.	89.8	94.6	86.4	89.8	83.8	86.4		
24.20	8.0	8.5	8.0	8.1	844766.	92.0	96.8	88.6	92.0	86.0	88.6		

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
313.0	199.0	313.0	213.0	313.0	219.0	313.0	209.0	199.0	158.0	213.0	157.0	219.0	164.0	209.0	155.0
313.0	206.0	313.0	219.0	313.0	226.0	313.0	217.0	206.0	162.0	219.0	166.0	226.0	172.0	217.0	163.0
312.0	224.0	312.0	230.0	312.0	235.0	312.0	229.0	224.0	172.0	230.0	176.0	235.0	176.0	229.0	174.0
312.0	237.0	312.0	239.0	313.0	242.0	313.0	238.0	237.0	183.0	239.0	189.0	242.0	189.0	238.0	186.0
312.0	239.0	313.0	241.0	313.0	244.0	313.0	241.0	239.0	190.0	241.0	194.0	244.0	195.0	241.0	192.0
312.0	246.0	313.0	246.0	313.0	248.0	313.0	246.0	246.0	199.0	246.0	201.0	248.0	202.0	246.0	198.0
312.0	248.0	312.0	248.0	313.0	249.0	313.0	248.0	248.0	204.0	248.0	204.0	249.0	207.0	248.0	204.0
310.0	252.0	311.0	252.0	312.0	253.0	312.0	252.0	252.0	208.0	252.0	209.0	253.0	211.0	252.0	207.0
309.0	265.0	308.0	265.0	309.0	269.5	309.0	262.5	265.0	231.0	265.0	231.0	269.5	240.0	262.5	231.0
305.0	269.0	305.0	268.0	305.0	272.0	305.0	271.0	269.0	240.0	268.0	240.0	272.0	246.0	271.0	245.0
304.0	269.0	304.0	268.0	304.0	272.0	304.0	271.0	269.0	239.0	268.0	239.0	272.0	246.0	271.0	244.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
158.0	134.0	157.0	134.0	164.0	136.0	155.0	134.0
162.0	138.0	166.0	140.0	172.0	142.0	163.0	140.0
172.0	143.0	176.0	146.0	176.0	145.0	174.0	146.0
183.0	151.0	189.0	154.0	189.0	154.0	186.0	154.0
190.0	154.0	194.0	159.0	195.0	160.0	192.0	159.0
199.0	159.0	201.0	164.0	202.0	166.0	198.0	164.0
204.0	164.0	204.0	168.0	207.0	171.0	204.0	168.0
208.0	167.0	209.0	172.0	211.0	175.0	207.0	172.0
231.0	196.0	231.0	197.5	240.0	210.0	231.0	198.0
240.0	210.0	240.0	210.0	246.0	214.0	245.0	215.0
239.0	210.0	239.0	209.0	246.0	219.0	244.0	217.0

RESULTS FROM THE TWENTY FIRST RUN
THIS RUN STARTED JUNE 21, 1977
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 425 PPM
D. CARBONATE : 850 PPM
E. PH : 6.9
F. ADDITIVE : AMMONIUM BIFLOURIDE
I. LEVEL : 32 PPM
G. OTHER :

					MINI EXCHANGER NUMBER 1							
					OVERALL HEAT TRANSFER COEFFICIENTS							
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS	
5171.7	173.0	168.4	168.4	177.7	.00	141.5	113.6	104.3	126.8	121.6	.00	
5534.8	180.0	175.4	177.7	177.7	.90	144.9	117.4	107.2	122.5	123.0	.90	
5013.9	194.2	191.8	191.8	189.5	1.83	110.2	99.2	91.5	99.5	100.1	1.83	
5203.6	205.9	198.8	198.7	191.7	2.95	94.2	87.9	84.4	87.2	88.4	2.95	
5205.4	198.8	189.4	191.7	191.7	4.02	86.3	80.3	77.2	81.3	81.3	4.02	
5280.2	203.5	198.7	198.7	196.4	4.90	79.8	78.9	76.1	78.0	78.2	4.90	
5247.7	208.2	201.2	198.7	194.1	6.20	76.7	74.1	72.8	72.4	74.0	6.20	
5274.8	203.7	201.3	201.2	189.5	6.98	69.9	70.1	69.7	66.9	69.1	6.98	
5229.5	187.4	182.8	175.7	196.8	13.97	45.1	43.1	37.5	50.4	44.0	13.97	
5159.9	183.1	185.4	180.7	185.4	22.02	36.1	37.7	32.4	34.4	35.2	22.02	
5245.6	187.9	199.6	187.9	190.2	24.20	36.6	40.1	33.2	34.8	36.2	24.20	

					MINI EXCHANGER NUMBER 2							
					OVERALL HEAT TRANSFER COEFFICIENTS							
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	
					HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS	
87.9	110.1	100.4	115.8	103.6	.00	81.3	76.4	86.6	74.7	79.7	.00	
95.4	102.7	99.2	109.2	101.6	.90	83.5	84.0	92.6	76.9	84.3	.90	
103.9	101.5	108.8	103.8	104.5	1.83	89.7	87.0	90.6	81.2	87.1	1.83	
104.0	89.4	93.7	91.4	94.6	2.95	92.9	92.8	92.8	83.2	90.4	2.95	
86.0	76.5	79.5	81.5	80.9	4.02	93.4	81.7	81.7	78.8	83.9	4.02	
80.5	74.6	75.4	79.8	77.6	4.90	98.5	85.1	81.3	78.4	85.8	4.90	
73.0	70.5	65.4	68.0	69.2	6.20	89.9	76.2	72.8	73.5	78.1	6.20	
69.9	67.1	64.8	66.8	67.1	6.98	90.8	78.1	73.9	70.2	78.3	6.98	
41.5	40.4	32.3	40.6	38.7	13.97	48.3	44.8	35.5	47.4	44.0	13.97	
32.4	31.8	27.9	28.8	30.2	22.02	33.9	34.3	34.4	33.1	33.9	22.02	
34.1	35.2	28.7	30.5	32.1	24.20	34.9	38.5	30.7	31.5	33.9	24.20	

THIS IS THE INPUT DATA FOR THE TWENTY FIRST RUN
THIS RUN STARTED JUNE 21, 1977
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 425 PPM
D. CARBONATE : 850 PPM
E. PH : 6.9
F. ADDITIVE : AMMONIUM BIFLOURIDE
I. LEVEL : 32 PPM
G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	322.0	112.0	5.1	87.4	106.0	823845.
.900	321.0	112.0	5.0	89.1	106.6	824449.
1.833	320.0	112.0	4.9	89.9	106.3	825123.
2.950	320.0	111.0	4.9	89.6	105.4	825855.
4.017	321.0	113.0	4.8	90.3	107.0	826584.
4.900	320.0	116.0	5.0	91.2	107.6	827187.
6.200	320.0	118.0	4.8	92.8	109.0	828088.
6.983	319.0	120.0	4.9	92.8	108.8	828627.
13.967	316.0	129.5	5.1	85.7	101.4	833108.
22.017	311.0	145.0	4.9	84.6	98.6	838876.
24.200	311.0	150.0	5.1	86.9	100.8	840336.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY FIRST RUN

THIS RUN STARTED JUNE 21, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PPM
- C. SILICA : 425 PPM
- D. CARBONATE: 850 PPM
- E. PH : 6.9
- F. ADDITIVE : AMMONIUM BIFLOURIDE
- 1. LEVEL : 32 PPM
- G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HRSQFTDEG F	RUN TIME HOURS
474.9	5541.6	96120.1	102868.4	144.5	.00
465.9	5944.4	93826.0	104168.9	149.0	.90
456.8	5411.0	91547.8	88562.6	133.8	1.83
456.8	5642.3	91982.2	88970.6	134.8	2.95
447.2	5637.9	89647.6	93963.8	134.3	4.02
466.1	5721.2	91642.8	93639.9	123.3	4.90
447.4	5680.8	87125.6	91845.0	117.1	6.20
457.0	5295.1	87667.4	84551.6	105.3	6.98
481.0	5922.1	86512.8	92790.4	78.3	13.97
458.7	5530.8	73489.9	77276.0	54.5	22.02
477.5	5632.8	74787.5	78139.9	54.3	24.20

THIS IS THE INPUT DATA FOR THE TWENTY SECOND RUN

THIS RUN STARTED JUNE 23, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 22 PPM
- C. SILICA : 440 PPM
- D. CARBONATE: 880 PPM
- E. PH : 7.0
- F. ADDITIVE : XFS-4029-MSA
- 1. LEVEL : 25 PPM
- G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.5	7.6	7.7	7.9	881160.	97.9	111.0	91.3	97.9	87.7	91.3
1.10	8.0	8.0	8.0	7.9	881831.	99.7	112.3	92.7	99.7	88.8	92.7
2.03	7.5	7.2	7.4	7.2	882411.	101.5	111.8	94.5	101.5	90.0	94.5
3.30	7.7	7.6	7.7	7.6	883187.	102.6	111.4	96.9	102.6	92.0	96.9
4.15	7.9	7.6	7.6	7.7	883713.	102.2	110.1	96.9	102.2	92.3	96.9
5.07	7.9	7.6	8.1	7.8	884270.	101.9	109.1	96.8	101.9	92.5	96.8
6.08	7.5	7.3	7.5	7.2	884903.	101.9	108.7	96.8	101.9	92.4	96.8
7.73	7.4	8.1	7.4	7.4	885943.	100.0	106.1	95.0	100.0	91.0	95.0
9.57	7.1	7.6	7.0	7.1	887000.	97.1	102.7	92.4	97.1	88.7	92.4
10.52	7.5	7.5	7.3	7.3	887608.	95.0	100.4	90.6	95.0	87.0	90.6

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
313.0	218.0	314.0	214.0	314.0	224.0	314.0	228.0	218.0	171.0	214.0	167.0	224.0	167.0	228.0	168.0
314.0	218.0	316.0	218.0	316.0	226.0	316.0	230.0	218.0	172.0	218.0	171.0	226.0	170.0	230.0	171.0
315.0	236.0	316.0	237.0	316.0	238.0	316.0	243.0	236.0	187.0	237.0	185.0	238.0	187.0	243.0	185.0
313.0	246.0	315.0	246.0	315.0	246.0	315.0	250.0	246.0	208.0	246.0	204.0	246.0	204.0	250.0	205.0
312.0	255.0	313.0	255.0	314.0	255.0	314.0	258.0	255.0	219.0	255.0	214.0	255.0	214.0	258.0	216.0
312.0	260.0	314.0	258.0	314.0	258.0	314.0	261.0	260.0	225.0	258.0	220.0	258.0	222.0	261.0	222.0
314.0	266.0	315.0	265.0	315.0	265.0	315.0	263.0	266.0	226.0	265.0	222.0	265.0	224.0	263.0	224.0
311.0	268.0	313.0	270.0	313.0	268.0	313.5	267.5	268.0	232.0	270.0	232.5	268.0	234.0	267.5	232.0
312.0	274.0	313.0	274.0	313.0	272.0	313.0	271.0	274.0	239.0	274.0	237.0	272.0	239.0	271.0	236.0
310.0	273.0	312.0	274.0	312.0	272.0	312.0	272.0	273.0	238.0	274.0	237.0	272.0	239.0	272.0	237.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
171.0	133.0	167.0	139.0	167.0	140.0	168.0	140.0
172.0	136.0	171.0	142.0	170.0	141.0	171.0	141.0
187.0	144.0	185.0	151.0	187.0	149.0	185.0	149.0
208.0	159.0	204.0	166.0	204.0	163.0	205.0	165.0
219.0	171.0	214.0	178.0	214.0	173.0	216.0	177.0
225.0	178.0	220.0	183.0	222.0	181.0	222.0	184.0
226.0	184.0	222.0	188.0	224.0	183.0	224.0	188.0
232.0	190.0	232.5	202.0	234.0	192.0	232.0	193.0
239.0	197.0	237.0	208.0	239.0	200.0	236.0	200.0
238.0	199.0	237.0	207.0	239.0	201.0	237.0	201.0

RESULTS FROM THE TWENTY SECOND RUN
 THIS RUN STARTED JUNE 23, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 22 PPM
 C. SILICA : 440 PPM
 D. CARBONATE: 880 PPM
 E. PH : 7.0
 F. ADDITIVE : XFS-4029-MSA
 I. LEVEL : 25 PPM
 G. OTHER :

						MINI EXCHANGER NUMBER 1					
						OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	HOURS
5032.0	175.4	177.6	180.0	184.6	.00	115.8	125.2	109.7	105.9	114.2	.00
5126.8	187.0	186.8	186.8	184.5	1.10	122.3	124.1	110.4	102.6	114.9	1.10
5051.6	175.2	168.1	172.8	169.1	2.03	90.2	86.0	87.0	77.8	85.2	2.03
5104.4	180.0	177.5	179.9	177.5	3.30	74.3	75.1	76.1	69.8	73.8	3.30
5017.0	184.8	177.7	177.6	180.0	4.15	63.4	61.9	62.8	62.3	62.6	4.15
5134.4	184.8	177.6	189.3	182.3	5.07	56.1	58.2	62.0	56.0	58.1	5.07
5201.9	175.3	170.5	175.2	168.2	6.08	50.4	51.1	52.5	52.8	51.7	6.08
4761.5	174.4	190.6	171.9	171.8	7.73	42.2	45.7	43.4	44.3	43.9	7.73
5288.2	166.1	177.7	163.7	166.0	9.57	37.4	41.0	39.9	41.6	39.9	9.57
5068.8	175.6	175.5	170.8	170.8	10.52	36.9	37.6	38.7	38.7	38.0	10.52

						MINI EXCHANGER NUMBER 2					
						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
					HOURS		BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	HOURS
85.2	90.0	106.0	112.0	98.3	.00	109.0	78.7	76.2	80.5	86.1	.00
92.4	94.9	110.0	111.9	102.3	1.10	110.1	84.2	85.5	86.8	91.7	1.10
82.5	84.6	84.1	92.3	85.9	2.03	107.5	77.7	89.7	83.6	89.6	2.03
57.8	64.1	64.9	67.4	63.6	3.30	100.5	74.7	83.3	78.8	84.3	3.30
50.9	56.8	56.8	55.5	55.0	4.15	86.4	61.1	71.6	66.9	71.5	4.15
48.2	51.6	51.7	53.4	51.2	5.07	77.3	58.1	68.8	60.4	66.1	5.07
50.5	53.8	52.3	48.1	51.2	6.08	67.9	53.2	67.2	55.2	60.9	6.08
43.3	48.9	40.0	42.1	43.6	7.73	57.5	43.1	55.7	51.9	52.1	7.73
40.1	45.6	37.4	40.8	41.0	9.57	53.5	38.0	48.3	45.7	46.4	9.57
39.3	41.6	36.1	38.5	38.9	10.52	49.7	37.1	46.6	44.4	44.5	10.52

THIS IS THE INPUT DATA FOR THE TWENTY SECOND RUN
 THIS RUN STARTED JUNE 23, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 22 PPM
 C. SILICA : 440 PPM
 D. CARBONATE: 880 PPM
 E. PH : 7.0
 F. ADDITIVE : XFS-4029-MSA
 I. LEVEL : 25 PPM
 G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
.000	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
1.100	321.0	106.0	4.8	88.7	105.0	29093.
2.033	323.0	110.0	4.7	89.9	106.4	29892.
3.300	324.0	111.0	5.0	91.0	107.1	30584.
4.150	322.0	116.0	5.1	93.1	108.7	31512.
5.066	321.0	120.0	5.1	93.3	108.0	32141.
6.083	321.0	126.0	5.0	93.6	108.1	32805.
7.733	322.0	130.0	5.2	93.5	107.9	33560.
9.566	320.0	134.5	4.8	92.0	106.2	34895.
10.516	320.0	136.0	5.4	89.8	104.2	36103.
	319.0	140.0	4.8	88.0	101.9	36774.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY SECOND RUN
THIS RUN STARTED JUNE 23, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 22 PPM
C. SILICA : 440 PPM
D. CARBONATE: 880 PPM
E. PH : 7.0
F. ADDITIVE : XFS-4029-MSA
1. LEVEL : 25 PPM
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/MRSQFTDEGF	RUN TIME HOURS
447.2	5999.1	92623.8	97589.4	210.8	.00
437.5	6124.0	89797.7	100843.6	158.8	1.10
465.2	6046.7	95495.5	97157.4	157.0	2.03
474.9	6107.2	94313.0	95081.6	131.1	3.30
475.2	5983.3	92085.6	87778.9	106.6	4.15
465.9	6127.6	87618.3	88671.8	91.2	5.07
484.3	6678.5	89706.1	95977.4	88.8	6.08
442.8	5441.7	79257.7	77116.9	68.3	7.23
503.4	5834.4	89383.4	83847.9	72.0	9.57
447.6	6036.3	77344.6	83736.1	62.2	10.52

THIS IS THE INPUT DATA FOR THE TWENTY THIRD RUN
THIS RUN STARTED JULY 11, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 22 PPM
C. SILICA : 500 PPM
D. CARBONATE: 1000 PPM
E. PH : 7.0
F. ADDITIVE : CALGON CL-165
1. LEVEL : 25 PPM
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F							
	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3			
	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT		
.00	7.3	7.5	7.6	7.3	917278.	101.0	113.4	95.0	101.0	91.8	95.0		
1.20	7.4	7.6	7.6	7.4	918050.	99.4	111.5	93.0	99.4	89.6	93.0		
2.30	7.2	7.3	7.3	7.2	918754.	100.9	111.3	94.1	100.9	90.3	94.1		
7.38	7.0	7.5	7.0	7.2	921988.	94.9	102.2	89.8	94.9	85.5	89.8		
8.00	7.2	7.6	7.3	7.2	922380.	94.6	101.7	89.5	94.6	85.2	89.5		
17.65	7.5	8.3	7.7	7.5	926555.	91.4	96.7	87.5	91.4	84.1	87.5		
19.40	7.3	7.8	7.7	7.4	929682.	92.9	98.1	89.0	92.9	85.6	89.0		
20.77	7.5	8.0	7.8	7.6	930550.	95.0	101.0	91.9	95.0	88.4	91.9		
22.77	7.5	8.0	7.5	7.6	931860.	97.9	102.6	94.2	97.9	91.0	94.2		
23.92	7.7	8.5	7.6	8.0	932620.	98.8	103.4	95.2	98.8	92.2	95.2		
25.02	7.3	7.9	7.5	7.3	933332.	99.2	103.8	95.6	99.2	92.6	95.6		
26.23	7.5	8.1	7.7	7.6	934128.	98.8	103.1	95.4	98.8	92.5	95.4		
34.35	7.4	7.8	7.6	7.4	939517.	91.7	95.7	88.4	91.7	85.6	88.4		
42.02	7.7	8.2	8.6	8.7	944562.	91.1	94.9	87.9	91.1	85.1	87.9		

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
310.0	206.0	307.0	213.0	308.0	202.0	309.0	210.0	206.0	163.0	213.0	153.0	202.0	153.0		
311.0	206.0	310.0	217.0	310.0	202.0	312.0	216.0	206.0	164.0	217.0	154.0	202.0	154.0		
314.0	215.0	310.0	229.0	310.0	217.0	312.0	231.0	215.0	174.0	229.0	173.0	217.0	165.0		
314.0	248.0	310.0	252.0	310.0	250.0	312.0	250.0	248.0	213.0	252.0	210.0	250.0	204.0		
314.0	250.0	310.0	253.0	310.0	251.0	312.0	252.0	250.0	214.0	253.0	213.0	251.0	207.0		
316.0	267.0	309.0	270.0	310.0	265.0	312.0	265.0	267.0	232.0	270.0	236.0	265.0	226.0		
315.0	267.0	307.0	268.0	308.0	265.0	310.0	265.0	267.0	235.0	268.0	236.0	265.0	229.0		
314.0	270.0	307.0	270.0	307.0	267.0	309.0	267.0	270.0	240.0	270.0	240.0	267.0	231.0		
313.0	271.0	307.0	271.0	307.0	268.0	308.0	268.0	271.0	242.0	271.0	242.0	268.0	234.0		
311.0	268.0	304.0	270.0	304.0	266.0	306.0	266.0	268.0	243.0	270.0	242.0	266.0	235.0		
311.0	269.0	304.0	270.0	304.0	266.0	305.0	266.0	269.0	242.0	270.0	241.0	266.0	232.0		
311.0	269.0	303.0	265.0	303.0	265.0	304.0	266.0	269.0	242.0	269.0	241.0	265.0	231.0		
310.5	271.5	295.5	271.5	297.0	270.0	299.0	269.5	271.5	244.0	271.5	243.5	270.0	237.0		
316.0	275.0	295.0	274.0	295.0	274.0	298.0	274.0	275.0	247.0	274.0	247.0	274.0	246.0		

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
163.0	131.0	153.0	136.0	153.0	133.0	161.0	137.0
164.0	133.0	154.0	139.0	154.0	134.0	162.0	139.0
174.0	137.0	173.0	144.0	165.0	139.0	175.0	146.0
213.0	170.0	210.0	174.0	204.0	169.0	206.0	174.0
214.0	175.0	213.0	175.0	207.0	171.0	210.0	175.0
232.0	206.0	236.0	209.0	226.0	196.0	229.0	201.0
235.0	211.0	236.0	209.0	229.0	201.0	233.0	205.0
240.0	216.0	240.0	214.0	231.0	202.0	236.0	207.0
242.0	219.0	242.0	217.0	234.0	207.0	236.0	208.0
243.0	220.0	242.0	219.0	235.0	208.0	236.0	210.0
242.0	219.0	241.0	219.0	232.0	207.0	236.0	211.0
242.0	221.0	241.0	220.0	231.0	208.0	234.0	212.0
244.0	226.0	243.5	224.0	237.0	213.0	237.5	213.0
247.0	230.0	247.0	228.0	246.0	224.0	246.0	225.0

RESULTS FROM THE TWENTY THIRD RUN
THIS RUN STARTED JULY 11, 1977
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 22 PPM
C. SILICA : 500 PPM
D. CARBONATE: 1000 PPM
E. PH : 7.0
F. ADDITIVE : CALGON CL-165
I. LEVEL : 25 PPM
G. OTHER :

MINI EXCHANGER NUMBER 1											
FLOUR RATES					OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
5304.4	170.9	175.9	178.1	171.0	.00	130.1	118.2	141.5	122.0	128.0	.00
5278.9	173.2	178.0	178.0	173.1	1.20	128.7	112.1	138.9	112.4	123.0	1.20
5248.1	168.3	170.9	170.9	168.4	2.30	113.1	89.9	108.1	87.5	99.6	2.30
5250.2	163.6	175.6	163.9	168.4	7.38	62.7	58.9	57.3	60.5	59.8	7.38
5288.4	168.3	178.0	170.9	168.4	8.00	61.5	57.9	57.9	57.6	58.7	8.00
5327.7	175.1	194.4	180.3	175.5	17.65	44.3	39.4	42.7	43.2	42.4	17.65
5251.5	170.5	182.9	180.5	173.3	19.40	43.0	38.1	41.7	41.7	41.1	19.40
5414.0	175.3	187.6	182.9	178.0	20.77	45.6	41.7	44.3	45.1	44.2	20.77
5460.7	175.4	187.6	175.9	178.1	22.77	40.1	37.2	38.1	39.5	38.7	22.77
5347.6	180.2	199.6	179.5	187.7	23.92	41.5	36.8	37.2	41.0	39.1	23.92
5407.7	170.9	185.5	176.1	171.3	25.02	40.0	35.6	38.2	38.1	38.0	25.02
5485.4	175.5	190.3	180.9	178.5	26.23	39.5	35.3	37.9	37.2	37.5	26.23
5444.7	172.1	182.7	177.9	173.0	34.35	37.7	25.5	28.0	29.6	30.2	34.35
5373.9	179.8	193.4	202.8	204.9	42.02	39.5	22.9	24.0	27.5	28.5	42.02

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	SQ.FT.	DEG. F		HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS
89.6	134.3	117.3	101.6	110.7	.00	116.7	65.3	80.6	83.0	86.4	.00
87.0	137.3	112.3	108.3	111.2	1.20	112.0	56.4	79.4	79.1	81.7	1.20
79.1	104.1	107.1	100.5	97.7	2.30	107.9	80.7	80.3	77.2	86.5	2.30
43.9	56.5	59.7	58.2	54.6	7.38	71.2	63.4	60.7	54.9	62.6	7.38
46.3	54.1	59.0	54.6	53.5	8.00	63.3	65.5	62.5	57.8	62.2	8.00
37.3	39.4	43.9	39.0	39.9	17.65	35.1	39.4	44.4	39.1	39.5	17.65
34.7	37.0	42.4	35.7	37.4	19.40	31.7	38.4	41.6	38.7	37.6	19.40
30.5	32.6	39.7	32.7	33.9	20.77	32.5	38.0	44.7	41.9	39.3	20.77
32.8	35.1	39.9	37.0	36.4	22.77	30.7	36.1	39.1	40.6	36.6	22.77
29.3	36.3	37.2	37.7	35.1	23.92	30.4	33.9	38.1	38.1	35.1	23.92
30.4	35.4	41.1	34.8	35.4	25.02	30.7	32.0	37.4	35.3	33.8	25.02
30.0	33.8	40.9	37.4	35.5	26.23	29.1	31.7	36.0	33.0	32.4	26.23
28.2	30.5	35.9	33.8	32.1	34.35	22.6	26.3	33.5	33.2	28.9	34.35
28.5	29.6	32.3	32.7	30.8	42.02	21.4	25.9	32.0	30.7	27.5	42.02

THIS IS THE INPUT DATA FOR THE TWENTY THIRD RUN

THIS RUN STARTED JULY 11, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 22 PPM
 C. SILICA : 500 PPM
 D. CARBONATE: 1000 PPM
 E. PH : 7.0
 F. ADDITIVE : CALGON CL-165
 1. LEVEL : 25 PPM
 G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	319.0	111.0	4.9	92.9	110.3	68430.
1.200	322.0	114.0	4.9	91.0	109.3	69275.
2.300	323.0	114.0	5.2	91.3	109.3	70044.
7.383	322.0	119.0	5.1	86.4	104.7	73581.
8.000	321.0	120.0	5.3	86.1	103.9	74009.
17.650	319.0	131.0	5.0	84.4	100.6	80750.
19.400	318.0	136.0	5.2	86.5	102.3	81980.
20.767	316.0	139.0	5.4	89.6	104.8	82928.
22.767	314.0	140.0	5.3	92.1	106.2	84359.
23.917	313.0	143.0	4.8	93.3	107.5	85189.
25.017	312.0	145.0	5.4	93.6	108.0	85965.
26.233	312.0	147.0	5.1	93.6	107.6	86837.
34.350	303.0	130.0	5.3	86.5	101.0	92723.
42.017	302.0	144.0	5.2	86.0	99.1	98257.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY THIRD RUN

THIS RUN STARTED JULY 11, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 22 PPM
 C. SILICA : 500 PPM
 D. CARBONATE: 1000 PPM
 E. PH : 7.0
 F. ADDITIVE : CALGON CL-165
 1. LEVEL : 25 PPM
 G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HRSQFTDEGF	RUN TIME HOURS
457.0	5809.6	91580.4	100884.8	233.7	.00
454.3	5768.9	91482.7	105359.1	154.7	1.20
484.0	5742.1	97509.5	103151.3	157.2	2.30
474.9	5729.5	92957.1	104639.9	109.0	7.38
493.8	5770.6	95696.8	102511.8	105.0	8.00
466.3	5810.1	84570.3	93934.7	74.8	17.65
485.2	5730.6	85208.6	90363.1	71.3	19.40
504.3	5909.6	86143.1	89646.1	71.9	20.77
495.5	5959.4	83189.6	83859.6	69.4	22.77
448.9	5823.5	73654.1	82528.7	64.0	23.92
505.3	5919.0	81442.8	85063.7	67.5	25.02
477.2	5985.9	76006.6	83634.9	63.0	26.23
493.4	5966.1	82255.1	86335.8	75.5	34.35
488.9	5869.9	74504.3	76741.4	57.0	42.02

RESULTS FROM THE TWENTY FOURTH RUN

THIS RUN STARTED JULY 20, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 17.6 PPM
 C. SILICA : 500 PPM
 D. CARBONATE: 1,000 PPM
 E. PH : 8.0
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR.	TUBE2 BTU/HR.	TUBE3 BTU/HR.	TUBE4 BTU/HR.	AVERAGE	TIME HOURS
5499.1	192.8	188.1	192.8	190.4	.00	143.4	108.3	120.0	130.7	125.6	.00
5605.0	171.4	169.2	169.2	166.8	.83	129.4	108.3	108.3	119.6	116.4	.83
5617.9	176.4	176.5	176.4	174.0	2.12	118.2	105.2	106.1	116.6	111.5	2.12
5703.5	183.5	181.3	181.3	178.8	3.32	109.8	96.4	97.3	108.8	103.1	3.32
5671.4	188.1	183.6	178.9	181.2	4.47	102.7	88.5	87.8	97.9	94.2	4.47
5676.2	190.6	190.7	188.3	188.2	5.27	97.8	88.7	87.6	96.6	92.7	5.27
5814.0	200.0	202.5	197.8	202.5	6.27	90.6	96.4	81.2	93.0	90.3	6.27
5744.6	192.5	209.6	185.8	185.7	13.00	55.6	56.5	52.3	55.2	54.9	13.00
5790.4	206.7	226.1	192.9	184.6	13.93	57.4	60.9	54.1	54.4	56.7	13.93
5750.1	197.4	220.5	189.6	183.6	15.18	53.2	57.8	51.3	49.6	53.0	15.18
5744.2	191.3	194.4	196.8	191.9	20.63	46.6	45.5	46.1	46.0	46.0	20.63
5776.1	193.5	196.7	199.1	194.2	21.63	47.1	45.1	45.6	45.5	45.8	21.63
5786.6	186.4	194.4	192.0	189.6	22.47	46.3	43.0	42.5	43.0	43.7	22.47
5780.8	217.2	230.0	227.6	227.5	23.93	47.9	42.6	43.6	44.9	44.8	23.93
5747.3	217.3	232.3	227.6	227.6	24.93	46.5	42.6	41.7	41.7	43.1	24.93

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	HOURS
87.2	111.8	106.1	100.1	101.3	.00
95.0	104.3	104.3	97.3	100.2	.83
103.5	103.5	103.5	96.4	101.7	2.12
104.2	104.5	104.4	99.8	103.2	3.32
99.7	101.6	100.0	98.6	100.0	4.47
95.1	95.4	96.7	91.5	94.7	5.27
98.4	101.1	98.5	96.5	98.6	6.27
43.1	52.7	46.9	46.5	47.3	13.00
44.4	56.2	47.3	42.8	47.7	13.93
38.8	49.2	42.3	41.0	42.8	15.18
33.0	39.2	35.1	31.2	34.6	20.63
33.0	37.7	35.1	32.8	34.7	21.63
32.7	37.9	36.0	34.1	35.2	22.47
36.7	37.7	35.9	35.9	36.6	23.93
33.3	36.0	35.3	35.3	35.0	24.93

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	HOURS
84.3	76.9	87.0	80.5	82.2	.00
76.9	73.4	85.5	78.9	78.7	.83
73.7	81.0	85.2	78.5	79.6	2.12
81.8	88.7	88.6	83.7	85.7	3.32
86.0	92.6	87.9	84.1	87.6	4.47
84.8	84.8	92.4	90.0	88.0	5.27
83.4	104.2	87.1	88.1	90.7	6.27
45.2	54.4	53.2	51.7	51.1	13.00
45.2	56.9	41.8	40.9	46.2	13.93
39.3	51.7	46.4	43.1	45.1	15.18
33.0	35.8	25.1	27.3	30.3	20.63
32.2	34.6	26.1	26.8	29.9	21.63
28.1	29.2	34.9	31.1	30.8	22.47
31.2	33.3	33.0	32.9	32.6	23.93
30.2	32.8	32.1	32.1	31.8	24.93

THIS IS THE INPUT DATA FOR THE TWENTY FOURTH RUN
THIS RUN STARTED JULY 20, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 17.6 PPM
- C. SILICA : 500 PPM
- D. CARBONATE : 1,000 PPM
- E. PH : 8.0
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- G. OTHER :

TIME HOURS	FLOWS				
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS
.00	8.2	8.0	8.2	8.1	946585.
.83	7.3	7.2	7.2	7.1	947140.
2.12	7.5	7.5	7.5	7.4	948012.
3.32	7.8	7.7	7.7	7.6	948829.
4.47	8.0	7.8	7.6	7.7	949624.
5.27	8.1	8.1	8.0	8.0	950174.
6.27	8.5	8.6	8.4	8.6	950862.
13.00	8.1	8.9	7.9	7.9	955607.
13.93	8.8	9.6	8.1	7.8	956255.
15.18	8.4	9.3	8.0	7.8	957130.
20.63	8.1	8.2	8.3	8.1	960918.
21.63	8.2	8.3	8.4	8.2	961612.
22.47	7.9	8.2	8.1	8.0	962194.
23.93	9.2	9.7	9.6	9.6	963219.
24.93	9.2	9.8	9.6	9.6	963918.

COOLING WATER TEMPERATURES IN DEG. F					
EXCH 1		EXCH 2		EXCH 3	
IN	OUT	IN	OUT	IN	OUT
98.7	108.3	90.8	96.7	87.6	90.8
97.1	108.5	91.2	97.1	88.0	91.2
99.3	109.6	93.6	99.3	90.4	93.6
100.6	110.3	94.2	100.6	90.6	94.2
101.9	110.9	95.5	101.9	91.8	95.5
101.5	110.3	95.5	101.5	91.6	95.5
102.4	110.6	96.3	102.4	92.6	96.3
91.9	97.7	88.0	91.9	85.0	88.0
91.5	97.2	87.7	91.5	84.9	87.7
91.2	96.6	87.6	91.2	84.7	87.6
89.3	94.2	86.2	89.3	83.9	86.2
89.3	94.1	86.2	89.3	84.0	86.2
89.8	94.6	86.7	89.8	84.6	86.7
93.6	98.3	90.5	93.6	88.4	90.5
95.4	100.0	92.3	95.4	90.1	92.3

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
301.0	199.0	301.0	216.0	301.0	211.0	302.0	205.0
304.0	204.0	302.0	214.0	302.0	214.0	303.0	207.0
301.0	208.0	300.0	215.0	301.0	215.0	301.0	208.0
300.0	216.0	298.0	222.0	299.0	222.0	300.0	215.0
301.0	222.0	299.0	228.0	299.0	227.0	300.0	222.0
300.0	224.0	299.0	229.0	299.0	229.0	300.0	224.0
300.0	230.0	298.0	226.0	298.0	234.0	298.0	228.0
292.0	244.5	286.5	243.0	288.0	242.5	289.0	241.0
292.0	244.5	286.5	241.5	288.0	241.0	288.0	239.0
290.0	244.5	283.5	240.5	285.0	240.5	285.0	240.5
292.0	250.0	284.0	245.0	284.0	245.0	285.0	245.0
294.0	251.0	285.0	246.0	285.0	246.0	286.0	246.0
294.0	252.0	284.0	248.0	284.0	248.0	285.0	248.0
293.0	255.0	284.0	253.0	284.0	252.0	285.0	252.0
292.0	256.0	284.0	254.0	284.0	254.0	284.0	254.0

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
199.0	162.0	216.0	163.0	211.0	163.0	205.0	161.0
204.0	160.0	214.0	162.0	214.0	162.0	207.0	160.0
208.0	160.0	215.0	164.0	215.0	164.0	208.0	162.0
216.0	168.0	222.0	171.0	222.0	171.0	215.0	168.0
222.0	174.0	228.0	176.0	227.0	175.0	222.0	173.0
224.0	176.0	229.0	179.0	229.0	178.0	224.0	177.0
230.0	180.0	226.0	177.0	234.0	182.0	228.0	180.0
244.5	214.0	243.0	209.5	242.5	209.0	241.0	208.0
244.5	214.5	241.5	208.0	241.0	208.0	239.0	208.0
244.5	217.5	240.5	211.0	240.5	211.0	240.5	211.0
250.0	225.0	245.0	217.0	245.0	220.0	245.0	222.0
251.0	226.0	246.0	219.0	246.0	221.0	246.0	222.0
252.0	226.0	248.0	220.0	248.0	221.0	248.0	222.0
255.0	229.0	253.0	228.0	252.0	228.0	252.0	228.0
256.0	233.0	254.0	231.0	254.0	231.0	254.0	231.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
162.0	137.0	163.0	139.0	163.0	137.0	161.0	137.0
160.0	137.0	162.0	139.0	162.0	136.0	160.0	136.0
160.0	139.0	164.0	140.0	164.0	139.0	162.0	139.0
168.0	143.0	171.0	143.0	171.0	143.0	168.0	142.0
174.0	146.0	176.0	145.0	175.0	145.0	173.0	145.0
176.0	148.0	179.0	150.0	172.0	147.0	177.0	147.0
180.0	151.0	177.0	144.0	182.0	151.0	180.0	150.0
214.0	185.5	209.5	179.5	209.0	176.5	208.0	176.5
214.5	188.0	208.0	179.5	208.0	183.0	208.0	182.5
217.5	193.0	211.0	184.0	211.0	183.0	211.0	184.0
225.0	203.0	217.0	195.0	220.0	204.0	222.0	204.0
226.0	204.0	219.0	197.0	221.0	204.0	222.0	204.0
226.0	205.0	220.0	200.0	221.0	197.0	222.0	200.0
229.0	208.0	228.0	207.0	228.0	207.0	228.0	207.0
233.0	213.0	231.0	211.0	231.0	211.0	231.0	211.0

THIS IS THE INPUT DATA FOR THE TWENTY FOURTH RUN
THIS RUN STARTED JULY 20, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 17.6 PPM
C. SILICA : 500 PPM
D. CARBONATE: 1,000 PPM
E. PH : 8.0
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	BRINE INLET TEMP	BRINE OUTLET TEMP	BRINE FLOW GAGE	COOLH2O INLET TEMP	COOLH2O OUTLET TEMP	COOLH2O FLOWRATE GALLONS
.000	309.0	101.0	4.6	88.4	103.4	102373.
.833	311.0	108.0	5.3	89.1	105.4	102944.
2.117	309.0	110.0	5.3	91.5	107.1	103843.
3.317	308.0	111.0	5.0	91.9	107.0	104686.
4.467	307.0	112.0	4.9	93.0	107.7	105507.
5.267	307.0	112.0	4.8	92.8	107.4	106075.
6.267	304.0	113.0	4.6	93.8	108.3	106785.
13.000	294.5	117.0	4.5	86.0	99.7	111690.
13.933	292.0	117.5	4.6	85.8	99.3	112358.
15.183	292.0	120.5	5.0	85.7	99.0	113261.
20.633	291.0	136.0	5.2	84.9	96.9	117168.
21.633	291.0	138.0	5.1	84.9	97.2	117885.
22.467	290.0	142.0	5.3	85.4	97.5	118487.
23.933	290.0	145.0	4.6	87.4	100.5	119543.
24.933	289.0	146.0	5.0	91.3	102.0	120264.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY FOURTH RUN
THIS RUN STARTED JULY 20, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 17.6 PPM
C. SILICA : 500 PPM
D. CARBONATE: 1,000 PPM
E. PH : 8.0
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HR SQ FT DEG F	RUN TIME HOURS
431.1	5663.0	86278.5	84774.4	183.9	.00
496.2	5781.9	96980.3	95211.2	171.9	.83
496.7	5799.6	95160.5	90292.0	152.2	2.12
468.8	5893.9	88914.4	88819.9	145.6	3.32
459.6	5860.8	86292.8	85980.9	143.7	4.47
450.2	5860.9	84531.7	86567.4	139.1	5.27
432.1	6012.8	79451.8	87010.8	85.1	6.27
424.6	5919.5	72533.8	80935.1	84.1	13.00
434.6	5973.2	72969.9	80476.2	80.8	13.93
472.4	5927.9	77966.4	78683.1	59.1	15.18
491.5	5931.3	73385.8	71033.8	58.1	20.63
482.0	5970.9	71054.7	73294.9	55.5	21.63
501.2	5958.1	71475.5	70760.1	50.0	22.47
435.0	5960.1	60789.4	66025.3	51.3	23.93
473.0	5930.0	65195.0	63323.6		24.93

THIS IS THE INPUT DATA FOR THE TWENTY FIFTH RUN
THIS RUN STARTED JULY 25, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 21 PPM
C. SILICA : 440 PPM
D. CARBONATE: 880 PPM
E. PH : 8.0
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F							
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3			
.00	7.8	7.8	7.8	7.9	115610.	IN 98.0	OUT 109.5	IN 92.2	OUT 98.0	IN 89.0	OUT 92.2		
.70	8.1	8.2	8.2	8.2	116081.	97.8	109.4	91.8	97.8	88.4	91.8		
2.02	8.4	8.4	8.3	8.3	116971.	98.7	110.1	92.5	98.7	89.0	92.5		
3.27	9.1	9.2	9.0	9.0	117813.	101.7	112.4	95.5	101.9	91.9	95.5		
3.97	9.1	9.3	9.0	9.0	118268.	102.4	111.9	96.2	102.4	92.2	96.2		
5.07	8.7	9.0	8.6	8.7	118995.	103.3	111.5	97.8	103.3	94.0	97.8		
5.62	9.0	9.3	8.9	8.9	119360.	102.7	111.1	97.2	102.7	93.2	97.2		
11.90	8.8	9.2	8.6	8.6	123499.	95.2	102.3	90.5	95.2	87.5	90.5		
21.12	8.8	9.5	8.6	8.3	129558.	92.4	98.3	88.2	92.4	85.6	88.2		

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
302.0	208.0	300.0	202.0	300.0	214.0	301.0	206.0	208.0	163.0	202.0	148.0	214.0	163.0	206.0	160.0
304.0	212.0	302.0	208.0	303.0	219.0	303.0	208.0	212.0	165.0	208.0	153.0	219.0	164.0	208.0	161.0
302.0	214.0	300.0	211.0	301.0	220.0	301.0	213.0	214.0	169.0	211.0	162.0	220.0	168.0	213.0	165.0
300.0	220.0	299.0	216.0	299.0	225.0	298.0	220.0	220.0	174.0	216.0	166.0	225.0	172.0	220.0	170.0
300.0	229.0	297.0	224.0	298.0	231.0	298.0	228.0	229.0	181.0	224.0	176.0	231.0	181.0	228.0	180.0
296.0	231.0	293.0	228.0	293.0	232.0	294.0	230.0	231.0	190.0	228.0	184.0	232.0	188.0	230.0	188.0
302.0	237.0	299.0	234.0	299.0	238.0	299.0	236.0	237.0	197.0	234.0	192.0	238.0	195.0	236.0	195.0
300.0	249.0	292.0	248.0	293.0	247.0	294.0	245.0	249.0	216.0	248.0	211.0	247.0	211.0	245.0	211.0
294.0	253.0	286.0	251.0	286.0	251.0	286.0	249.0	253.0	224.0	251.0	221.0	251.0	220.0	249.0	219.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
163.0	139.0	148.0	130.0	163.0	136.0	160.0	136.0
165.0	139.0	153.0	131.0	164.0	137.0	161.0	137.0
169.0	142.0	162.0	134.0	168.0	139.0	165.0	139.0
174.0	145.0	166.0	139.0	172.0	143.0	172.0	144.0
181.0	151.0	176.0	144.0	181.0	151.0	181.0	151.0
190.0	159.0	184.0	150.0	188.0	155.0	188.0	157.0
197.0	165.0	192.0	156.0	195.0	161.0	195.0	163.0
216.0	190.0	211.0	182.0	211.0	180.0	211.0	180.0
224.0	199.0	221.0	191.0	220.0	183.0	219.0	184.0

RESULTS FROM THE TWENTY FIFTH RUN

THIS RUN STARTED JULY 25, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 21 PPM
- C. SILICA : 440 PPM
- D. CARBONATE: 880 PPM
- E. PH : 8.0
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
5552.2	183.3	183.5	183.5	185.8	.00	123.9	133.5	111.2	128.4	124.3	.00
5576.4	190.2	192.7	192.7	192.7	.70	122.4	129.6	110.3	130.6	123.2	.70
5557.6	197.4	197.6	195.2	195.2	2.02	122.4	126.2	109.0	121.9	119.9	2.02
5360.4	214.1	216.6	211.9	212.0	3.27	114.5	122.5	103.0	111.1	112.8	3.27
5451.0	214.1	219.1	212.0	212.0	3.97	99.3	107.4	92.5	97.8	99.2	3.97
5473.9	205.1	212.5	203.0	205.3	5.07	87.1	92.0	81.2	86.6	86.7	5.07
5434.1	211.6	218.9	209.5	209.5	5.62	85.9	90.5	80.1	83.4	85.0	5.62
5432.2	207.0	217.3	203.0	202.9	11.90	65.0	60.2	58.8	62.9	61.7	11.90
5462.5	207.6	225.0	203.7	196.6	21.12	53.3	50.6	45.8	47.0	49.2	21.12

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	
BTU/HR. SQ.FT. DEG. F					
95.3	132.3	105.2	101.8	108.7	.00
97.6	128.6	112.9	103.5	110.7	.70
97.1	112.5	108.8	105.6	106.0	2.02
100.1	118.0	113.1	104.7	109.0	3.27
97.1	104.5	99.3	94.5	98.8	3.97
77.3	89.9	82.7	80.5	82.6	5.07
72.8	82.0	77.9	74.9	76.9	5.62
49.7	60.0	54.7	52.0	54.1	11.90
42.2	48.1	45.1	42.6	44.5	21.12

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	
BTU/HR. SQ.FT. DEG. F					
81.1	75.8	94.1	86.6	84.4	.00
87.3	89.3	94.3	85.7	89.1	.70
85.5	101.1	94.1	86.1	91.7	2.02
92.8	98.1	94.9	90.8	94.2	3.27
89.6	107.4	88.7	88.7	93.6	3.97
78.5	99.3	86.3	80.7	86.2	5.07
75.7	96.6	82.8	76.8	83.0	5.62
42.6	52.9	53.4	53.4	50.6	11.90
34.5	47.0	54.7	49.9	46.6	21.12

THIS IS THE INPUT DATA FOR THE TWENTY FIFTH RUN

THIS RUN STARTED JULY 25, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 21 PPM
- C. SILICA : 440 PPM
- D. CARBONATE: 880 PPM
- E. PH : 8.0
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

TIME HOURS	BRINE		BRINE		BRINE FLOW GAGE	COOLH2O		COOLH2O		COOLH2O FLOWRATE GALLONS
	INLET TEMP	OUTLET TEMP	INLET TEMP	OUTLET TEMP		INLET TEMP	OUTLET TEMP	INLET TEMP	OUTLET TEMP	
.000	307.0	105.0			5.1	90.0	104.4			122908.
.700	308.0	108.0			5.0	89.4	103.5			123433.
2.017	306.0	108.0			4.9	90.0	103.7			124424.
3.267	306.0	110.0			4.8	93.0	106.4			125363.
3.967	303.0	111.0			4.8	93.2	106.2			125870.
5.067	300.0	112.0			5.0	95.1	108.1			126681.
5.617	305.0	113.0			4.7	94.4	107.8			127086.
11.900	298.0	111.0			4.7	88.4	101.6			131695.
21.117	289.0	121.0			4.6	86.5	99.8			138460.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY FIFTH RUN

THIS RUN STARTED JULY 25, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 21 PPM

C. SILICA : 440 PPM

D. CARBONATE: 880 PPM

E. PH : 8.0

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A CO2 PAD ON THE VERTICAL U-TUBE EXCHANGER

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HRSGFTDEGF	RUN TIME HOURS
478.4	6195.0	92998.0	89030.2	233.8	.00
468.8	6216.6	90251.4	87478.1	145.6	.70
459.8	6205.8	87634.6	84849.7	144.2	2.02
450.4	5980.3	84989.8	79975.0	146.1	3.27
451.1	6087.7	83364.3	78982.0	134.3	3.97
470.6	6077.9	85139.9	78854.8	146.3	5.07
441.3	6055.2	81570.1	80977.2	131.3	5.62
442.8	6066.0	79666.6	79911.4	108.1	11.90
435.2	6088.9	70354.3	80819.9	79.4	21.12

THIS IS THE INPUT DATA FOR THE TWENTY SIXTH RUN

(THIS RUN STARTED AUGUST 2, 1977)

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 20 PPM

C. SILICA : 460 PPM

D. CARBONATE: 920 PPM

E. PH : 6.8

F. ADDITIVE : PEI-18-ITACONIC ACID

1. LEVEL : 12 PPM

G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.9	7.9	7.8	7.7	131509.	92.7	104.0	87.0	92.7	84.1	87.0
.90	8.2	8.2	8.2	8.0	132139.	94.3	105.2	88.1	94.3	84.8	88.1
1.73	8.0	8.1	8.2	8.0	132722.	97.7	108.3	91.3	97.7	87.8	91.3
2.88	8.4	8.4	8.5	8.4	133525.	99.0	109.5	92.3	99.0	88.3	92.3
4.00	8.4	8.4	8.4	8.2	134300.	100.7	110.7	93.6	100.7	89.5	93.6
5.29	8.6	8.7	8.6	8.5	135210.	99.1	108.1	92.7	99.1	90.0	92.7
6.37	8.2	8.4	8.3	8.2	135955.	96.9	105.7	90.8	96.9	86.2	90.8
21.85	8.7	8.8	8.2	9.0	146765.	86.7	92.0	82.4	86.7	79.4	82.4
22.80	8.2	8.2	8.2	8.1	147424.	90.0	95.2	85.7	90.0	82.2	85.7

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
314.0	212.0	313.0	223.0	313.0	200.0	314.0	203.0	212.0	170.0	223.0	170.0	200.0	158.0	203.0	160.0
319.0	223.0	316.0	233.0	316.0	212.0	317.0	216.0	223.0	176.0	233.0	178.0	212.0	166.0	216.0	168.0
320.0	229.0	318.0	237.0	318.0	219.0	319.0	222.0	229.0	180.0	237.0	181.0	219.0	166.0	222.0	169.0
321.0	232.0	318.0	239.0	319.0	224.0	320.0	226.0	232.0	182.0	239.0	185.0	224.0	172.0	226.0	174.0
322.0	240.0	319.0	243.0	319.0	234.0	320.0	234.0	240.0	187.0	243.0	191.0	234.0	179.0	234.0	179.0
325.0	246.0	321.0	248.0	321.0	244.0	322.0	243.0	246.0	193.0	248.0	198.0	244.0	187.0	243.0	188.0
315.0	242.0	314.0	244.0	314.0	242.0	314.0	241.0	242.0	194.0	244.0	197.0	242.0	188.0	241.0	169.0
323.0	279.0	313.0	279.0	314.0	279.0	314.0	276.0	279.0	243.0	279.0	243.0	279.0	243.0	276.0	241.0
326.0	280.0	315.0	279.0	315.0	279.0	316.0	279.0	280.0	246.0	279.0	246.0	279.0	245.0	279.0	244.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
170.0	136.0	170.0	137.0	158.0	133.0	160.0	134.0
176.0	140.0	178.0	144.0	166.0	138.0	163.0	139.0
180.0	143.0	181.0	148.0	166.0	141.0	169.0	141.0
152.0	146.0	185.0	151.0	172.0	144.0	174.0	144.0
187.0	150.0	191.0	154.0	179.0	148.0	179.0	148.0
193.0	154.0	198.0	159.0	187.0	152.0	188.0	153.0
194.0	153.0	197.0	158.0	188.0	151.0	189.0	151.0
243.0	208.0	243.0	205.0	243.0	203.0	241.0	202.0
246.0	209.0	246.0	206.0	245.0	207.0	244.0	207.0

RESULTS FROM THE TWENTY SIXTH RUN

THIS RUN STARTED AUGUST 2, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PPM
- C. SILICA : 460 PPM
- D. CARBONATE: 920 PPM
- E. PH : 6.8
- F. ADDITIVE : PEI-18-ITACONIC ACID
- 1. LEVEL : 12 PPM
- G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	OVERALL HEAT TRANSFER COEFFICIENTS				AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	TUBE1	TUBE2	TUBE3	TUBE4		HOURS
							BTU/HR. SQ.FT.	DEG. F			
5782.5	184.6	184.7	182.4	180.0	.00	119.8	101.6	138.1	131.8	122.8	.00
5801.0	191.2	191.5	191.5	186.7	.90	111.9	94.2	127.5	118.6	113.0	.90
5763.2	186.4	188.9	191.3	186.5	1.73	103.8	91.5	120.9	113.9	107.5	1.73
5709.8	195.7	195.9	198.2	195.8	2.88	104.4	91.3	116.8	113.1	106.4	2.88
5819.5	195.6	195.8	195.8	191.1	4.00	96.9	89.6	103.4	101.8	97.9	4.00
5693.7	199.9	202.6	200.3	197.9	5.29	87.9	82.5	87.2	88.4	86.5	5.29
5766.7	191.6	196.3	194.0	191.6	6.37	83.1	81.4	83.2	83.6	82.8	6.37
5744.1	202.4	205.8	191.6	210.3	21.85	45.8	36.7	35.2	42.2	40.0	21.85
5776.3	190.5	191.6	191.6	189.1	22.80	45.8	37.0	37.0	37.5	39.3	22.80

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	HOURS		BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	HOURS
84.0	101.4	94.6	92.9	93.2	.00	91.5	81.3	74.2	74.3	80.3	.00
89.5	99.8	97.4	96.2	95.7	.90	94.8	85.6	80.0	79.0	84.9	.90
88.0	98.4	110.6	104.5	100.4	1.73	98.8	85.2	76.3	81.7	85.5	1.73
93.6	97.0	107.8	104.3	100.7	2.88	100.3	89.6	85.5	89.3	91.2	2.88
97.5	92.9	108.3	105.7	101.1	4.00	98.3	93.4	87.8	85.6	91.2	4.00
86.9	80.6	97.1	92.4	89.2	5.29	78.7	75.1	74.2	72.4	75.1	5.29
77.2	75.8	90.5	86.0	82.4	6.37	95.8	88.9	91.6	92.5	92.2	6.37
41.5	42.2	39.3	42.5	41.4	21.85	41.3	46.1	45.5	49.2	45.5	21.85
39.3	38.4	39.7	40.5	39.5	22.80	45.1	49.6	47.1	45.4	46.8	22.80

THIS IS THE INPUT DATA FOR THE TWENTY SIXTH RUN

THIS RUN STARTED AUGUST 2, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PPM
- C. SILICA : 460 PPM
- D. CARBONATE: 920 PPM
- E. PH : 6.8
- F. ADDITIVE : PEI-18-ITACONIC ACID
- 1. LEVEL : 12 PPM
- G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	322.0	108.0	4.7	85.6	101.3	152950.
.900	325.0	111.0	4.6	85.6	101.2	153586.
1.730	325.0	112.0	5.0	89.1	104.4	154175.
2.880	325.0	113.0	5.2	89.9	105.2	154986.
4.000	326.0	115.0	5.2	90.6	106.1	155766.
5.290	328.0	117.0	5.2	91.3	105.9	156684.
6.370	322.0	116.0	5.0	87.2	102.9	157434.
21.850	319.0	126.0	4.8	79.9	93.7	168303.
22.800	319.0	129.0	5.2	83.0	96.9	168964.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY SIXTH RUN
THIS RUN STARTED AUGUST 2, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 29,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 460 PPM
D. CARBONATE: 920 PPM
E. PH : 6.8
F. ADDITIVE : PEI-18-ITACONIC ACID
1. LEVEL : 12 PPM
G. OTHER :

BRINE FLOW LB/HR	COOLN20 FLOW LB/HR	BRINE FLUX BTU/HR	COOLN20 FLUX BTU/HR	OVERALL HTC BTU/HR SQFT DEG F	RUN TIME HOURS
437.7	5840.7	90245.8	91516.0	126.0	.00
427.8	5865.4	88231.3	91317.3	109.8	.90
465.0	5825.1	95461.4	88946.2	123.2	1.73
483.6	5751.6	98820.0	87823.8	124.0	2.88
483.3	5876.1	98324.9	90897.2	120.7	4.00
482.8	5734.4	98254.8	83555.1	107.4	5.29
465.6	5801.4	92463.8	90899.6	103.6	6.37
447.6	5759.6	83320.5	79323.2	65.4	21.85
485.0	5810.3	88877.6	80601.7	68.9	22.80

THIS IS THE INPUT DATA FOR THE TWENTY SEVENTH RUN
THIS RUN STARTED AUGUST 9, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 20 PPM
C. SILICA : 420 PPM
D. CARBONATE: 840 PPM
E. PH : 6.9
F. ADDITIVE : CALGON CL-165
1. LEVEL : 12 PPM
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F							
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3			
.00	7.6	7.5	7.7	7.6	148705.	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1.00	7.7	7.5	8.0	7.8	149383.	93.8	105.2	87.7	93.8	84.4	87.7		
1.77	8.1	8.2	8.5	8.1	149907.	95.0	106.9	89.8	95.0	86.5	89.8		
3.00	7.9	7.8	8.0	7.8	150750.	95.1	105.8	89.0	95.1	85.8	89.0		
3.83	8.0	8.0	8.3	8.2	151354.	96.3	105.9	90.1	96.3	86.8	90.1		
5.25	8.2	8.1	8.4	8.5	152281.	103.0	112.9	96.5	103.0	92.8	96.5		
5.98	8.6	8.1	8.3	8.4	152774.	104.2	114.0	97.4	104.2	93.5	97.4		
6.57	8.2	8.1	8.1	8.0	153164.	104.2	113.5	97.4	104.2	93.5	97.4		
12.28	9.0	8.8	8.7	8.7	157054.	98.3	106.4	91.8	98.3	87.2	91.8		

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
315.0	217.0	310.0	216.0	314.0	220.0	316.0	212.0
319.0	220.0	312.0	220.0	316.0	225.0	319.0	217.0
320.0	224.0	314.0	224.0	318.0	224.0	321.0	219.0
319.0	230.0	312.0	229.0	317.0	230.0	319.0	229.0
316.0	231.0	312.0	231.0	316.0	231.0	317.0	231.0
316.0	234.0	309.0	233.0	316.0	233.0	317.0	232.0
317.0	236.0	309.0	236.0	317.0	236.0	319.0	234.0
317.0	237.0	309.0	237.0	317.0	237.0	319.0	236.0
314.5	247.5	301.0	247.0	316.0	247.0	316.0	244.5

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
217.0	173.0	216.0	168.0	220.0	158.0	212.0	160.0
220.0	179.0	220.0	174.0	225.0	163.0	217.0	162.0
224.0	180.0	224.0	177.0	224.0	161.0	219.0	164.0
230.0	186.0	229.0	183.0	230.0	171.0	229.0	170.0
231.0	189.0	231.0	184.0	231.0	175.0	231.0	174.0
234.0	190.0	233.0	185.0	233.0	175.0	232.0	174.0
236.0	192.0	236.0	187.0	236.0	177.0	234.0	175.0
237.0	193.0	237.0	189.0	237.0	178.0	236.0	177.0
247.5	205.5	247.0	200.5	247.0	190.0	244.5	189.5

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
173.0	134.0	168.0	137.0	168.0	134.0	160.0	128.0
179.0	140.0	174.0	140.0	163.0	134.0	162.0	132.0
180.0	140.0	177.0	144.0	161.0	139.0	164.0	134.0
166.0	147.0	163.0	145.0	171.0	139.0	170.0	137.0
189.0	148.0	184.0	146.0	175.0	146.0	174.0	140.0
190.0	150.0	185.0	150.0	175.0	146.0	174.0	141.0
192.0	151.0	187.0	150.0	177.0	147.0	175.0	141.0
193.0	151.0	189.0	153.0	178.0	148.0	177.0	141.0
205.5	158.5	200.5	159.0	190.0	154.0	189.5	146.5

RESULTS FROM THE TWENTY SEVENTH RUN

THIS RUN STARTED AUGUST 9, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PPM
- C. SILICA : 420 PPM
- D. CARBONATE: 840 PPM
- E. PH : 6.9
- F. ADDITIVE : CALGON CL-165
- 1. LEVEL : 12 PPM
- G. OTHER :

FLOWRATES						MINI EXCHANGER NUMBER 1					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	OVERALL HEAT TRANSFER COEFFICIENTS					
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
							BTU/HR. SQ.FT. DEG. F				HOURS
5599.4	177.5	175.6	180.0	177.4	.00	112.7	108.7	108.6	121.6	112.9	.00
5640.3	179.5	175.5	186.8	181.9	1.00	116.5	107.6	110.1	123.0	114.3	1.00
5645.8	188.8	191.6	198.3	188.7	1.77	107.8	104.1	111.4	116.4	109.9	1.77
5987.5	184.2	182.5	186.7	181.9	3.00	99.7	94.0	99.3	99.9	98.2	3.00
5394.5	186.8	187.1	193.8	191.4	3.83	97.9	94.4	101.6	101.2	98.8	3.83
5544.9	191.5	189.8	196.1	198.4	5.25	97.7	91.7	101.7	105.5	99.1	5.25
5505.9	200.7	189.8	193.7	195.8	5.98	98.9	86.0	95.5	101.5	95.5	5.98
5611.1	191.4	189.8	189.0	186.5	6.57	94.7	86.2	93.5	95.6	92.5	6.57
5612.3	210.3	206.9	203.1	203.1	12.28	80.0	65.6	79.4	82.9	77.0	12.28

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
					HOURS						HOURS
	BTU/HR. SQ.FT. DEG. F						BTU/HR. SQ.FT. DEG. F				
79.4	88.6	123.0	103.8	98.7	.00	103.9	82.0	71.7	99.0	89.2	.00
67.2	75.8	113.9	102.4	89.8	1.00	96.4	84.8	87.7	90.8	89.9	1.00
76.7	84.6	129.2	107.5	99.5	1.77	100.8	83.0	66.4	88.5	84.7	1.77
76.1	80.3	112.3	110.5	94.8	3.00	88.8	88.6	86.5	89.1	88.3	3.00
74.4	85.8	111.6	112.8	96.2	3.83	99.9	97.2	81.2	100.4	94.7	3.83
80.2	89.5	118.5	121.1	102.3	5.25	103.0	91.9	86.8	105.8	96.9	5.25
81.6	88.2	114.9	118.5	100.8	5.98	106.1	93.9	84.8	104.4	97.3	5.98
79.2	87.5	114.0	113.6	98.5	6.57	104.7	89.5	82.8	105.5	95.6	6.57
69.0	77.0	97.3	94.9	84.5	12.28	102.9	91.2	84.7	107.5	96.6	12.28

THIS IS THE INPUT DATA FOR THE TWENTY SEVENTH RUN

THIS RUN STARTED AUGUST 9, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PPM
- C. SILICA : 420 PPM
- D. CARBONATE: 840 PPM
- E. PH : 6.9
- F. ADDITIVE : CALGON CL-165
- 1. LEVEL : 12 PPM
- G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	BALLONS
.000	318.0	105.0	4.8	85.3	99.8	170502.
1.000	320.0	111.0	5.0	87.5	102.2	171241.
1.767	320.0	113.0	4.8	86.8	100.8	171816.
3.000	319.0	114.0	5.2	88.1	101.7	172737.
3.833	317.0	116.0	5.1	94.0	108.8	173396.
5.250	317.0	116.0	5.0	94.6	109.3	174410.
5.983	318.0	118.0	4.9	94.7	109.7	174950.
6.567	318.0	118.0	5.1	94.6	109.5	175375.
12.283	317.0	115.5	4.8	88.1	101.9	179613.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY SEVENTH RUN

THIS RUN STARTED AUGUST 9, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 20 PPM
- C. SILICA : 420 PPM
- D. CARBONATE: 840 PPM
- E. PH : 6.9
- F. ADDITIVE : CALGON CL-165
- 1. LEVEL : 12 PPM
- G. OTHER :

BRINE	COOLH2O	BRINE	COOLH2O	OVERALL	RUN
FLOW	FLOW	FLUX	FLUX	HTC	TIME
LB/HR	LB/HR	BTU/HR	BTU/HR	BTU/HR SQFT DEG F	HOURS
447.9	6109.8	91871.6	88414.9	135.4	.00
466.1	6195.1	93859.4	90885.4	119.1	1.00
447.4	6174.4	89254.0	86268.2	101.4	1.77
485.0	6538.2	95803.7	88741.5	107.0	3.00
476.1	5905.7	92216.7	87229.0	126.9	3.83
466.7	6079.2	90408.5	89185.6	130.0	5.25
457.2	6004.8	88133.8	89891.7	120.5	5.98
475.9	6118.0	91731.1	90975.5	122.7	6.57
443.4	6130.0	86099.0	84425.0	96.3	12.28

THIS IS THE INPUT DATA FOR THE TWENTY EIGHTH RUN
THIS RUN STARTED AUGUST 24, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : ---
C. SILICA : 8 PPM
D. CARBONATE: ---
E. PH : 8.4
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.6	7.5	7.5	7.6	171039.	98.2	110.8	91.7	98.2	88.3	91.7
1.08	7.6	7.6	7.6	7.8	171759.	101.1	114.2	94.2	101.1	90.4	94.2
2.07	7.9	7.8	8.1	8.2	172410.	101.7	114.7	95.0	101.7	91.5	95.0
2.73	7.7	7.5	7.8	7.7	172848.	102.3	115.0	95.6	102.3	91.8	95.6
18.07	8.2	8.1	8.2	8.2	182992.	94.0	106.6	87.4	94.0	83.8	87.4
18.93	8.0	8.0	8.0	8.0	183554.	94.7	107.5	88.1	94.7	84.6	88.1
19.90	8.3	7.8	8.2	8.1	184180.	97.2	109.6	90.4	97.2	86.7	90.4
27.87	8.0	8.2	8.2	8.1	189057.	101.9	114.3	95.4	101.9	91.9	95.4

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
322.0	213.0	320.0	224.0	321.0	226.0	321.0	206.0	213.0	161.0	224.0	166.0	226.0	163.0	206.0	159.0
328.0	219.0	325.0	231.0	325.0	231.0	326.0	216.0	219.0	171.0	231.0	173.0	231.0	169.0	216.0	166.0
324.0	220.0	322.0	230.0	322.0	230.0	322.0	216.0	220.0	168.0	230.0	170.0	230.0	168.0	216.0	166.0
321.0	216.0	319.0	226.0	319.0	229.0	320.0	214.0	216.0	170.0	226.0	172.0	229.0	167.0	214.0	166.0
313.0	212.0	306.0	220.0	306.0	220.0	307.0	208.0	212.0	167.0	220.0	167.0	220.0	164.0	208.0	158.0
314.0	216.0	306.0	219.0	306.0	220.0	307.0	211.0	216.0	170.0	219.0	170.0	220.0	166.0	211.0	161.0
314.0	214.0	305.0	217.0	306.0	220.0	307.0	212.0	214.0	172.0	217.0	172.0	220.0	169.0	212.0	167.0
318.0	225.0	299.0	224.0	301.0	224.0	303.0	216.0	225.0	176.0	224.0	177.0	224.0	175.0	216.0	171.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
161.0	136.0	166.0	140.0	163.0	139.0	159.0	131.0
171.0	141.0	173.0	143.0	169.0	144.0	166.0	138.0
168.0	140.0	170.0	144.0	168.0	143.0	166.0	139.0
170.0	140.0	172.0	142.0	167.0	142.0	166.0	138.0
167.0	139.0	167.0	140.0	164.0	133.0	158.0	133.0
170.0	140.0	170.0	138.0	166.0	133.0	161.0	134.0
172.0	142.0	172.0	139.0	169.0	136.0	167.0	138.0
176.0	149.0	177.0	148.0	175.0	150.0	171.0	145.0

RESULTS FROM THE TWENTY EIGHTH RUN

THIS RUN STARTED AUGUST 24, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : ---
C. SILICA : 8 PPM
D. CARBONATE: ---
E. PH : 8.4
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

MINI EXCHANGER NUMBER 1											
FLOW RATES					OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	BTU/HR. SQ.FT.	HOURS
5484.4	176.9	174.8	174.7	177.0	.00	130.8	109.5	107.2	142.6	122.5	.00
5454.0	176.4	176.7	176.7	181.2	1.08	130.8	108.6	108.6	137.9	121.5	1.08
5421.1	183.7	181.6	188.6	190.9	2.07	129.4	109.3	113.5	140.0	123.1	2.07
5452.7	179.4	174.9	181.9	179.4	2.73	132.5	110.4	109.9	135.3	122.0	2.73
5358.1	191.7	190.0	192.4	192.3	18.07	131.2	109.1	110.5	133.1	121.0	18.07
5344.0	187.0	187.7	187.7	187.6	18.93	125.5	112.7	111.0	128.1	119.3	18.93
5031.1	194.0	183.1	192.4	189.9	19.90	129.0	108.3	109.6	123.2	117.5	19.90
5330.1	186.6	193.0	192.8	190.3	27.87	122.0	107.3	109.4	125.4	116.0	27.87

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
106.8	108.5	119.2	101.2	109.0	.00	84.0	80.0	76.1	100.9	85.3	.00
94.7	107.7	118.1	106.2	106.7	1.08	92.8	90.0	76.3	95.0	88.5	1.08
103.7	111.9	121.7	106.9	111.1	2.07	91.2	79.4	81.1	93.6	86.3	2.07
95.5	103.3	125.9	103.4	107.0	2.73	98.0	92.4	82.9	96.1	92.3	2.73
91.4	103.2	112.5	110.0	104.3	18.07	83.0	78.6	79.5	83.6	86.2	18.07
90.5	95.6	107.5	106.8	100.1	18.93	81.2	88.5	98.3	82.4	87.6	18.93
89.6	89.5	107.2	97.9	96.0	19.90	83.1	88.7	97.8	84.3	88.5	19.90
96.9	95.9	101.2	97.3	97.8	27.87	76.4	85.0	72.9	80.4	78.7	27.87

THIS IS THE INPUT DATA FOR THE TWENTY EIGHTH RUN
 THIS RUN STARTED AUGUST 24, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : ---
 C. SILICA : 8 PPM
 D. CARBONATE : ---
 E. PH : 8.4
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER :

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	328.0	104.0	5.4	89.2	107.1	187249.
1.083	322.0	112.0	5.4	91.4	108.8	188033.
2.067	328.0	113.0	4.9	92.5	109.5	188744.
2.733	325.0	113.0	5.3	92.8	109.5	189221.
18.067	313.0	110.0	5.0	84.6	101.3	200255.
18.933	313.0	110.0	5.1	85.4	102.1	200864.
19.900	313.0	111.0	5.1	87.5	104.1	201540.
27.867	306.0	120.0	5.0	92.9	109.1	206805.

RESULTS FROM THE MAIN EXCHANGER FOR THE TWENTY EIGHTH RUN
 THIS RUN STARTED AUGUST 24, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : ---
 C. SILICA : 8 PPM
 D. CARBONATE : ---
 E. PH : 8.4
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER :

BRINE	COOLH2O	BRINE	COOLH2O	OVERALL	RUN
FLOW	FLOW	FLUX	FLUX	HTC	TIME
LB/HR	LB/HR	BTU/HR	BTU/HR	BTU/HR SQ FT DEG F	HOURS
501.4	5976.3	108231.6	106762.6	178.1	.00
502.9	5963.1	101774.3	103551.1	162.1	1.08
455.0	5910.0	94317.6	100268.3	148.1	2.07
492.8	5937.7	100720.4	98960.9	124.2	2.73
467.6	5812.4	91426.1	96872.3	129.1	18.07
477.0	5777.0	93254.6	96283.6	130.9	18.93
477.0	5459.0	92801.1	90437.9	114.6	19.90
469.2	5791.1	84067.2	93628.8		27.87

THIS IS THE INPUT DATA FOR THE FIRST SEPTEMBER RUN
 THIS RUN STARTED SEPTEMBER 6, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 25 PPM
 C. SILICA : 0 PPM
 D. CARBONATE : 0 PPM
 E. PH : 6.8
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS LOW AND THE COOLING WATER FLOW WAS LOW

TIME	FLOWS				COOL H2O	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1	TUBE 2	TUBE 3	TUBE 4		EXCH 1	EXCH 2	EXCH 3			
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	4.0	4.0	4.0	4.1	190775.	103.2	116.1	96.6	103.2	93.0	96.6
.48	4.1	4.1	4.3	4.0	191101.	103.7	116.6	97.2	103.7	93.7	97.2
.92	4.0	4.1	4.2	4.0	191375.	103.4	116.4	96.8	103.4	93.1	96.8

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
310.0	210.0	316.0	215.0	316.0	202.0	316.0	216.0	210.0	168.0	215.0	170.0	202.0	163.4		
310.0	212.0	316.0	226.0	316.0	203.0	316.0	216.0	212.0	168.0	226.0	169.0	203.0	165.4		
310.4	214.0	316.0	226.0	316.0	205.0	316.0	217.0	214.0	170.0	226.0	172.0	205.0	165.9		

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
168.0	137.0	170.0	142.0	163.4	138.5	170.0	139.0
169.0	139.0	169.0	142.0	165.4	139.2	172.0	140.0
170.0	140.0	172.0	142.0	165.9	140.0	173.0	141.0

RESULTS FROM THE FIRST SEPTEMBER RUN
THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 0 PPM
- D. CARBONATE: 0 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS LOW AND THE COOLING WATER FLOW WAS LOW

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
5542.1	175.4	193.8	185.0	178.7	.00	134.1	136.4	150.6	129.7	137.7	.00
5202.1	180.3	198.7	197.6	173.9	.48	129.4	120.8	150.7	124.1	131.3	.48
5391.6	175.3	198.7	195.1	173.9	.92	127.9	123.2	149.3	125.5	131.5	.92

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	SQ.FT.	DEG. F		HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS
102.5	106.8	108.8	103.3	105.4	.00	100.1	93.5	94.0	97.5	96.3	.00
101.1	113.5	104.5	95.0	103.5	.48	92.8	90.5	93.9	92.2	92.3	.48
99.8	110.1	106.7	94.2	103.2	.92	94.0	97.0	95.0	93.8	94.9	.92

THIS IS THE INPUT DATA FOR THE FIRST SEPTEMBER RUN
THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 0 PPM
- D. CARBONATE: 0 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS LOW AND THE COOLING WATER FLOW WAS MEDIUM

FLOWS					COOLING WATER TEMPERATURES IN DEG. F						
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	4.1	4.1	4.0	4.0	191924.	99.1	107.6	95.1	99.1	93.1	95.1
.48	4.2	4.0	4.1	4.1	192442.	99.7	108.2	95.6	99.7	93.5	95.6
.87	4.1	3.9	4.1	4.1	192854.	99.6	108.1	95.5	99.6	93.4	95.5

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
310.5	204.0	316.0	219.0	316.0	199.5	316.0	206.0	204.0	164.0	219.0	164.0	199.5	159.4	206.0	162.0
310.3	205.0	316.0	214.0	316.0	200.0	317.0	207.0	205.0	165.0	214.0	164.0	200.0	159.7	207.0	164.0
309.0	204.0	315.0	214.0	315.0	199.2	316.0	205.0	204.0	164.0	214.0	162.0	199.2	159.5	205.0	162.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
164.0	132.0	164.0	137.0	159.4	135.2	162.0	134.0
165.0	136.0	164.0	136.0	159.7	135.5	164.0	135.0
164.0	134.0	162.0	137.0	159.5	134.9	162.0	134.0

RESULTS FROM THE FIRST SEPTEMBER RUN
THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 0 PPM
- D. CARBONATE : 0 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- B. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS LOW AND THE COOLING WATER FLOW WAS MEDIUM

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
8852.9	180.3	198.7	185.0	173.9	.00	140.2	130.1	149.7	136.7	139.2	.00
8855.6	185.3	193.8	190.0	178.6	.48	141.4	135.0	151.8	138.2	141.6	.48
8853.7	180.4	189.0	190.1	178.7	.87	140.3	132.9	152.6	140.4	141.5	.87

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS						
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
101.7	116.3	108.9	104.9	108.0	.00	104.8	95.1	91.6	94.9	96.6	.00
103.8	113.8	112.3	105.2	108.8	.48	98.6	99.9	95.5	98.6	98.1	.48
103.7	116.1	112.0	107.6	109.9	.87	101.8	93.3	96.9	99.3	97.8	.87

THIS IS THE INPUT DATA FOR THE FIRST SEPTEMBER RUN
THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 0 PPM
- D. CARBONATE : 0 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- B. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS LOW AND THE COOLING WATER FLOW WAS HIGH

FLOWS					COOLING WATER TEMPERATURES IN DEG. F							
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3		
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT	
.00	4.1	3.8	4.0	4.1	193632.	95.7	100.1	93.7	95.7	92.8	93.7	
.38	4.0	4.0	4.0	4.1	194490.	95.2	99.6	93.1	95.2	92.2	93.1	
.73	4.1	4.0	3.9	4.1	195270.	94.0	98.3	92.0	94.0	91.4	92.0	
1.20	4.1	4.0	4.0	4.0	196323.	91.7	96.1	89.7	91.7	88.8	89.7	

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
308.4	195.0	315.0	202.0	315.0	190.5	316.0	195.0	195.0	156.0	202.0	153.0	190.5	151.4	195.0	154.0
308.4	197.0	315.0	207.0	315.0	185.6	315.0	194.0	197.0	154.0	207.0	154.0	185.6	148.0	194.0	151.0
309.2	193.0	315.0	207.0	315.0	287.0	315.0	193.0	193.0	155.0	207.0	154.0	287.0	149.1	193.0	151.0
310.0	192.0	315.0	205.0	315.0	188.5	315.0	191.0	192.0	156.0	205.0	155.0	188.5	148.3	191.0	153.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
156.0	130.0	153.0	130.0	151.4	128.6	154.0	130.0
154.0	129.0	154.0	129.0	148.0	124.3	151.0	128.0
155.0	128.0	154.0	129.0	149.1	126.8	151.0	127.0
156.0	128.0	155.0	128.0	148.3	125.4	153.0	126.0

RESULTS FROM THE FIRST SEPTEMBER RUN

THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 25 PPM

C. SILICA : 0 PPM

D. CARBONATE: 0 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS LOW AND THE COOLING WATER FLOW WAS HIGH

						MINI EXCHANGER NUMBER 1					
						OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
18520.2	180.5	184.2	185.1	178.7	.00	151.0	145.2	161.0	152.3	152.4	.00
18425.8	175.5	193.9	185.1	178.8	.38	145.5	141.9	167.2	152.4	151.7	.38
18647.7	180.4	193.9	180.0	178.8	.73	150.7	139.9	66.8	151.6	127.3	.73
18553.9	180.3	193.9	185.1	174.0	1.20	151.2	141.5	159.3	151.0	150.8	1.20

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT.	DEG. F			HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
111.0	122.6	119.3	114.6	116.9	.00	97.8	95.4	98.3	95.1	96.7	.00
116.9	128.5	126.4	122.6	123.6	.38	95.9	101.0	100.6	96.7	98.6	.38
109.8	124.4	165.1	117.7	129.3	.73	84.4	83.8	80.4	82.0	82.7	.73
103.7	117.5	118.7	107.4	111.8	1.20	96.1	98.8	96.8	97.1	97.2	1.20

THIS IS THE INPUT DATA FOR THE FIRST SEPTEMBER RUN

THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 25 PPM

C. SILICA : 0 PPM

D. CARBONATE: 0 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS HIGH AND THE COOLING WATER FLOW WAS LOW

FLOWS						COOLING WATER TEMPERATURES IN DEG. F					
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	6.3	6.4	6.2	6.4	207218.	100.7	117.2	90.1	100.7	83.3	90.1
.48	6.2	6.3	6.3	6.4	207566.	100.9	117.5	90.3	100.9	83.5	90.3
.90	6.3	6.4	6.4	6.3	207845.	101.3	117.7	90.7	101.3	83.9	90.7

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
315.2	241.0	319.0	241.0	319.0	235.0	319.0	240.0	241.0	191.0	241.0	191.0	235.0	185.4	240.0	192.0
316.0	243.0	319.0	243.0	319.0	235.0	319.0	242.0	243.0	192.0	243.0	192.0	235.0	186.2	242.0	193.0
316.5	242.0	319.0	242.0	319.0	235.0	319.0	242.0	242.0	193.0	242.0	193.0	235.0	185.4	242.0	193.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
191.0	157.0	191.0	154.0	185.6	153.5	192.0	151.0
192.0	157.0	192.0	154.0	186.2	153.9	193.0	153.0
193.0	157.0	193.0	154.5	185.4	153.3	193.0	153.0

RESULTS FROM THE FIRST SEPTEMBER RUN

THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 0 PPM
- D. CARBONATE: 0 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- H. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS HIGH AND THE COOLING WATER FLOW WAS LOW

						MINI EXCHANGER NUMBER 1						
						OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	FLOWRATES		TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
		TUBE2 LB/HR	TUBE3 LB/HR									
5936.1	288.6	310.1	296.0	288.4	.00	150.7	158.2	164.0	154.2	156.8	.00	
5512.0	283.5	305.2	301.0	288.4	.48	141.9	148.9	160.2	146.2	149.3	.48	
5739.2	288.4	310.1	306.1	283.6	.90	147.2	154.0	164.1	147.5	153.2	.90	

MINI EXCHANGER NUMBER 2											
						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
137.6	142.5	145.6	134.8	140.1	.00	124.7	137.8	129.4	142.4	133.6	.00
131.2	136.2	140.3	129.6	134.3	.48	120.5	133.6	125.6	133.5	128.3	.48
132.8	137.5	146.7	131.7	137.2	.90	125.8	137.7	130.6	135.5	132.4	.90

MINI EXCHANGER NUMBER 3											
						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
137.6	142.5	145.6	134.8	140.1	.00	124.7	137.8	129.4	142.4	133.6	.00
131.2	136.2	140.3	129.6	134.3	.48	120.5	133.6	125.6	133.5	128.3	.48
132.8	137.5	146.7	131.7	137.2	.90	125.8	137.7	130.6	135.5	132.4	.90

THIS IS THE INPUT DATA FOR THE FIRST SEPTEMBER RUN

THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 25 PPM
- C. SILICA : 0 PPM
- D. CARBONATE: 0 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- H. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS HIGH AND THE COOLING WATER FLOW WAS MEDIUM

FLOWS						COOLING WATER TEMPERATURES IN DEG. F					
TIME HOURS	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3	
						IN	OUT	IN	OUT	IN	OUT
.00	6.3	6.3	6.3	6.3	208546.	94.6	105.5	88.2	94.6	84.4	88.2
.40	6.3	6.4	6.3	6.3	209015.	95.0	105.9	88.4	95.0	84.6	88.4
1.05	6.2	6.4	6.4	6.3	209777.	95.6	106.3	89.1	95.6	85.4	89.1

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
315.0	231.0	317.0	231.0	316.0	225.0	316.0	231.0	231.0	182.0	231.0	182.0	225.0	175.1	231.0	183.0
315.4	231.0	316.0	231.0	316.0	224.6	316.0	231.0	231.0	182.0	231.0	182.0	224.6	175.6	231.0	183.0
314.3	231.0	316.0	231.0	316.0	224.1	316.0	231.0	231.0	183.0	231.0	183.0	224.1	175.4	231.0	183.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
182.0	150.0	182.0	147.0	175.1	144.5	183.0	145.0
182.0	150.0	182.0	148.0	175.6	144.8	183.0	147.0
183.0	150.0	183.0	148.0	175.4	145.0	183.0	147.0

RESULTS FROM THE FIRST SEPTEMBER RUN

THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 25 PPM

C. SILICA : 0 PPM

D. CARBONATE: 0 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS HIGH AND THE COOLING WATER FLOW WAS MEDIUM

						MINI EXCHANGER NUMBER 1						
						OVERALL HEAT TRANSFER COEFFICIENTS						
		FLOURATES										
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS	
9682.8	288.6	305.5	301.4	284.0	.00	162.6	168.3	176.1	161.9	167.2	.00	
9680.4	288.5	310.6	301.4	284.0	.40	163.2	169.5	177.2	162.3	168.0	.40	
9680.3	283.8	310.6	306.5	284.0	1.05	160.2	168.4	178.5	161.2	167.1	1.05	

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
141.4	145.3	154.7	138.3	144.9	.00	126.3	139.2	137.0	141.3	136.0	.00
144.1	149.2	156.1	141.0	147.6	.40	126.6	137.6	137.1	135.6	134.2	.40
140.6	146.6	157.1	140.6	146.2	1.05	126.3	138.6	136.9	135.2	134.2	1.05

THIS IS THE INPUT DATA FOR THE FIRST SEPTEMBER RUN

THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 25 PPM

C. SILICA : 0 PPM

D. CARBONATE: 0 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS HIGH AND THE COOLING WATER FLOW WAS HIGH

FLOWS						COOLING WATER TEMPERATURES IN DEG. F					
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	6.3	6.3	6.3	6.2	212827.	92.5	98.7	89.0	92.5	87.1	89.0
.55	6.3	6.3	6.3	6.3	214044.	94.1	100.3	90.6	94.1	88.7	90.6
.92	6.3	6.3	6.4	6.3	214853.	95.1	101.2	91.6	95.1	89.8	91.6

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
314.4	224.0	316.0	224.0	316.0	215.0	316.0	224.0	224.0	175.0	224.0	175.0	215.0	166.6	224.0	176.0
315.5	225.0	316.0	225.0	316.0	216.6	316.0	226.0	225.0	176.0	225.0	175.0	216.6	168.4	226.0	176.0
313.7	225.0	315.0	225.0	315.0	216.4	316.0	226.0	225.0	176.0	225.0	175.0	216.4	168.8	226.0	176.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
175.0	146.0	175.0	144.0	166.6	138.0	176.0	143.0
176.0	146.0	175.0	145.0	168.4	139.7	176.0	145.0
176.0	147.0	175.0	146.0	168.8	140.2	176.0	145.0

RESULTS FROM THE FIRST SEPTEMBER RUN

THIS RUN STARTED SEPTEMBER 6, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 25 PPM

C. SILICA : 0 PPM

D. CARBONATE: 0 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS WAS A RUN FOR LASL, THE BRINE FLOW WAS HIGH AND THE COOLING WATER FLOW WAS HIGH

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
18298.1	288.7	305.7	301.4	279.2	.00	174.3	180.1	193.7	172.4	180.1	.00
18223.1	288.5	305.7	301.4	284.0	.55	174.4	179.8	192.5	172.0	179.7	.55
18261.3	288.8	305.8	306.7	284.0	.92	173.5	179.1	193.8	171.7	179.5	.92

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					TIME
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	HOURS
	BTU/HR. SQ.FT.	DEG. F			
152.3	156.4	168.3	147.7	156.2	.00
152.8	159.4	167.5	152.5	158.0	.55
154.5	161.2	169.5	154.1	159.8	.92

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					TIME
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	HOURS
	BTU/HR. SQ.FT.	DEG. F			
128.4	138.8	147.4	137.1	137.9	.00
132.4	138.3	147.0	134.6	138.1	.55
127.8	133.4	145.6	133.2	135.0	.92

THIS IS THE INPUT DATA FOR THE FIRST NOVEMBER RUN
THIS RUN STARTED NOVEMBER 2, 1977
THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000-PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 34 PPM
- C. SILICA : 400 PPM
- D. CARBONATE: 800 PPM
- E. PH : 7.0
- F. ADDITIVE : NONE
- G. LEVEL : NONE
- H. OTHER : THIS WAS A RUN FOR LASL

FLOWS					COOLING WATER TEMPERATURES IN DEG. F						
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	6.4	6.4	6.4	6.4	400774.	79.1	91.9	71.0	79.1	66.1	71.0
1.08	6.3	6.4	6.3	6.4	401731.	82.2	94.9	73.8	82.2	68.7	73.8
2.57	6.4	6.3	6.3	6.3	403121.	84.8	95.8	76.8	84.8	71.2	76.8
3.55	6.4	6.4	6.3	6.3	404012.	86.4	96.7	78.4	86.4	72.9	78.4
5.52	6.4	6.4	6.5	6.5	405786.	86.3	95.0	79.0	86.3	73.6	79.0
6.48	6.4	6.4	6.4	6.4	406658.	84.6	92.3	77.7	84.6	72.6	77.7
10.30	6.4	6.4	6.4	6.4	410123.	75.2	81.2	69.4	75.2	64.7	69.4

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
304.0	214.0	304.0	220.0	305.0	223.0	304.4	220.5
308.0	219.0	308.0	225.0	308.0	227.0	307.5	224.6
310.0	237.0	310.0	240.0	310.0	239.0	309.5	237.8
313.0	248.0	313.0	251.0	314.0	247.0	313.2	247.8
314.0	260.0	314.0	264.0	315.0	259.0	314.2	261.3
314.0	265.0	314.0	268.0	315.0	263.0	313.0	265.0
314.0	274.0	314.0	278.0	315.0	273.0	313.9	276.7

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
214.0	169.0	220.0	165.0	223.0	164.0	220.5	160.6
219.0	173.0	225.0	170.0	227.0	168.0	224.6	164.7
237.0	177.0	240.0	178.0	239.0	174.0	237.8	182.2
248.0	197.0	251.0	198.0	247.0	193.0	247.8	195.3
260.0	213.0	264.0	217.0	259.0	211.0	261.3	214.6
265.0	222.0	268.0	225.0	263.0	218.0	265.0	221.2
274.0	240.0	278.0	242.0	273.0	236.0	276.7	239.4

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
169.0	130.0	165.0	132.0	164.0	132.0	160.6	134.2
173.0	133.0	170.0	137.0	168.0	136.0	164.7	138.0
177.0	146.0	178.0	152.0	174.0	150.0	182.2	151.3
197.0	158.0	198.0	163.0	193.0	159.0	195.3	163.0
213.0	176.0	217.0	182.0	211.0	179.0	214.6	181.7
222.0	186.0	225.0	190.0	218.0	184.0	221.2	189.0
240.0	205.0	242.0	210.0	236.0	205.0	239.4	209.3

RESULTS FROM THE FIRST NOVEMBER RUN
THIS RUN STARTED NOVEMBER 2, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 34 PPM
- C. SILICA : 400 PPM
- D. CARBONATE: 800 PPM
- E. PH : 7.0
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS WAS A RUN FOR LASL

MINI EXCHANGER NUMBER 1											
OVERALL HEAT TRANSFER COEFFICIENTS											
COOL H2O	FLOWRATES				TIME	TUBE2				AVERAGE	TIME
LB/HR	TUBE1	TUBE2	TUBE3	TUBE4	HOURS	TUBE1	TUBE2	TUBE3	TUBE4		HOURS
	LB/HR	LB/HR	LB/HR	LB/HR		BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	DEG. F	
7317.3	295.1	312.3	308.1	290.4	.00	140.3	155.9	151.0	149.7	154.2	.00
7751.6	289.6	311.7	302.6	290.0	1.08	160.3	157.2	152.0	151.9	155.4	1.08
7499.9	294.2	306.6	302.3	284.9	2.57	126.6	125.3	125.7	123.3	125.2	2.57
7461.1	293.8	311.0	301.7	284.4	3.55	111.3	110.8	114.6	109.9	111.6	3.55
7470.3	293.7	310.9	311.7	293.8	5.52	89.4	87.5	93.9	88.2	89.7	5.52
7516.5	293.7	310.9	306.7	289.2	6.48	78.3	77.5	82.8	77.1	78.9	6.48
7532.2	293.7	310.9	306.7	289.1	10.30	58.1	56.2	61.0	55.3	57.7	10.30

MINI EXCHANGER NUMBER 2											
OVERALL HEAT TRANSFER COEFFICIENTS											
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR.	BTU/HR.	BTU/HR.		HOURS		BTU/HR.	BTU/HR.	BTU/HR.		HOURS
	BTU/HR.	BTU/HR.	BTU/HR.				BTU/HR.	BTU/HR.	BTU/HR.		
132.1	150.0	153.7	154.3	147.5	.00	138.9	131.7	129.4	114.9	128.7	.00
137.5	154.0	157.8	159.7	152.2	1.08	144.5	134.0	132.5	119.9	132.7	1.08
142.6	146.2	152.4	131.1	143.1	2.57	122.3	110.3	109.6	113.3	113.9	2.57
116.7	120.8	124.2	117.4	119.8	3.55	116.3	109.6	111.2	102.1	109.8	3.55
97.1	97.4	102.2	95.9	98.2	5.52	96.3	92.3	91.6	87.9	92.0	5.52
85.7	86.6	91.3	86.1	87.4	6.48	84.8	83.8	82.8	78.8	82.5	6.48
61.4	63.9	66.3	63.4	63.8	10.30	66.6	64.0	64.7	60.4	63.9	10.30

THIS IS THE INPUT DATA FOR THE THIRTIETH RUN
THIS RUN STARTED SEPTEMBER 13, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : ---
- C. SILICA : 410 PPM
- D. CARBONATE: 820 PPM
- E. PH : 6.7
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS RUN HAD SCALE OUTSIDE OF THE TUBES

COOLING WATER TEMPERATURES IN DEG. F											
EXCH 1											
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	IN	OUT	IN	OUT	IN	OUT
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS						
.00	4.1	4.1	4.0	4.0	221272.	87.7	99.8	80.7	87.7	76.8	80.7
1.68	4.3	4.4	4.5	4.3	222450.	94.0	105.5	87.1	94.0	83.1	87.1
2.67	4.3	4.3	4.5	4.4	223133.	95.8	106.8	89.1	95.8	85.2	89.1
3.73	4.3	4.3	4.2	4.3	223884.	96.4	107.0	89.4	96.4	85.3	89.4
4.77	4.2	4.1	4.1	4.2	224605.	93.9	104.7	86.9	93.9	82.7	86.9
5.43	4.4	4.3	4.3	4.4	225068.	94.7	105.0	88.1	94.7	83.9	88.1
22.63	4.5	4.6	4.5	4.5	237125.	91.3	100.8	84.5	91.3	79.5	84.5
23.90	4.6	4.7	4.7	4.6	238015.	93.4	103.5	86.4	93.4	81.3	86.4
25.72	4.5	4.7	4.9	4.9	239278.	94.8	104.2	87.7	94.8	82.4	87.7
27.15	4.7	4.5	4.6	4.6	240282.	92.8	101.6	86.2	92.8	80.8	86.2
27.70	4.5	4.5	4.5	4.5	240659.	92.2	101.0	85.8	92.2	80.7	85.8

EXCHANGER NUMBER 1 TEMPS IN DEG. F											
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
309.0	204.0	315.0	226.0	315.0	206.0	316.0	210.0	204.0	162.0	226.0	165.0
309.6	214.0	316.0	231.0	316.0	216.5	316.0	218.0	214.0	168.0	231.0	172.0
307.3	216.0	313.0	231.0	314.0	217.4	314.0	220.0	216.0	170.0	231.0	172.0
306.5	222.0	313.0	235.0	313.0	216.8	314.0	225.0	222.0	174.0	235.0	177.0
307.4	223.0	314.0	234.0	314.0	217.5	315.0	225.0	223.0	175.0	234.0	174.0
306.5	224.0	314.0	235.0	314.0	219.6	314.0	226.0	224.0	176.0	235.0	176.0
315.2	246.0	316.0	245.0	316.0	242.9	316.0	243.0	246.0	198.0	245.0	198.0
318.0	248.0	319.0	250.0	319.0	245.8	319.0	245.0	248.0	199.0	250.0	199.0
316.0	247.0	315.0	249.0	316.0	246.7	316.0	249.0	247.0	200.0	249.0	199.0
314.2	250.0	313.0	247.0	313.0	247.2	314.0	250.0	250.0	201.0	247.0	200.0
312.1	249.0	311.0	248.0	311.0	244.5	313.0	250.0	249.0	201.0	248.0	200.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
162.0	133.0	165.0	132.0	159.5	130.2	162.0	134.0
166.0	149.0	172.0	142.0	167.1	138.3	172.0	141.0
170.0	141.0	172.0	143.0	169.2	140.5	172.0	143.0
174.0	145.0	177.0	146.0	168.1	139.8	176.0	146.0
175.0	144.0	174.0	145.0	168.5	140.0	177.0	146.0
176.0	145.0	176.0	146.0	170.5	141.6	176.0	147.0
198.0	157.0	198.0	153.0	194.6	156.7	193.0	150.0
199.0	159.0	199.0	157.0	196.3	158.8	197.0	159.0
200.0	162.0	199.0	167.0	197.0	158.1	201.0	161.0
201.0	159.0	200.0	159.0	200.3	161.5	201.0	163.0
201.0	160.0	200.0	156.0	199.2	162.1	201.0	164.0

RESULTS FROM THE THIRTIETH RUN
THIS RUN STARTED SEPTEMBER 13, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : ---
C. SILICA : 410 PPM
D. CARBONATE: 820 PPM
E. PH : 6.7
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN HAD SCALE OUTSIDE OF THE TUBES

MINI EXCHANGER NUMBER 1											
FLOUR RATES						OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
5786.9	180.4	198.8	185.1	173.9	.00	126.9	107.6	132.2	118.6	121.3	.00
5732.1	190.3	213.3	210.3	188.3	1.68	117.8	108.5	132.1	115.8	118.5	1.68
5816.4	190.5	208.7	210.5	193.2	2.67	113.8	104.4	130.2	115.1	115.9	2.67
5756.7	190.5	208.7	195.4	188.4	3.73	104.6	99.3	122.6	105.8	108.1	3.73
5742.0	185.5	198.9	190.2	183.6	4.77	101.4	97.5	119.5	104.3	105.7	4.77
5789.5	195.5	208.6	200.4	193.2	5.43	101.2	97.7	118.5	104.0	105.3	5.43
5806.4	199.6	223.0	210.3	197.8	22.63	79.4	91.1	89.0	83.6	85.7	22.63
5742.6	204.3	227.5	220.1	202.3	23.90	83.1	90.5	91.1	87.7	88.9	23.90
5787.5	199.6	228.0	230.6	217.0	25.72	79.8	86.8	92.7	83.7	85.7	25.72
5665.0	209.6	218.4	215.7	202.8	27.15	76.1	82.5	81.2	73.4	78.3	27.15
5785.1	199.9	218.7	210.8	198.1	27.70	73.8	81.1	83.4	72.7	77.8	27.70

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
88.6	127.5	101.3	95.2	103.2	.00	82.4	87.2	91.3	79.7	86.2	.00
94.9	124.5	112.1	90.2	105.4	1.68	83.3	95.9	96.6	88.2	91.0	1.68
94.1	123.0	108.8	96.8	105.7	2.67	87.4	93.0	96.5	86.1	90.7	2.67
96.2	119.0	105.9	94.8	104.0	3.73	85.2	89.5	92.6	85.5	88.2	3.73
91.6	118.3	101.8	88.9	100.2	4.77	87.0	87.0	98.2	83.8	86.5	4.77
91.9	115.6	101.2	89.1	99.5	5.43	89.4	91.5	90.8	85.9	89.4	5.43
77.5	85.0	84.2	82.5	82.3	22.63	88.0	110.7	87.2	75.7	90.4	22.63
79.9	92.1	88.7	79.0	84.9	23.90	87.8	104.0	89.9	83.4	91.3	23.90
76.0	92.2	94.2	83.5	86.5	25.72	84.5	73.4	103.8	96.9	89.6	25.72
79.2	80.3	79.0	76.7	78.8	27.15	95.2	97.3	89.4	81.3	90.8	27.15
74.8	82.4	76.1	75.4	77.1	27.70	87.4	105.6	83.0	76.3	88.1	27.70

THIS IS THE INPUT DATA FOR THE THIRTIETH RUN
THIS RUN STARTED SEPTEMBER 13, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : ---
C. SILICA : 410 PPM
D. CARBONATE: 820 PPM
E. PH : 6.7
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN HAD SCALE OUTSIDE OF THE TUBES

TIME	BRINE	BRINE	BRINE	COOLH2O	COOLH2O	COOLH2O
HOURS	INLET	OUTLET	FLOW	INLET	OUTLET	FLOWRATE
	TEMP	TEMP	GAGE	TEMP	TEMP	GALLONS
.000	315.7	94.0	5.3	77.5	93.9	229684.
1.683	315.6	100.0	5.0	83.8	99.8	230943.
2.667	313.7	101.7	5.0	86.0	101.4	231677.
3.733	314.4	101.4	5.1	86.1	99.2	232662.
4.767	314.6	98.8	5.3	83.4	96.8	233613.
5.433	313.5	100.4	4.9	84.7	97.7	234220.
22.633	320.9	99.4	5.1	80.2	93.7	250043.
23.900	323.0	105.7	5.1	82.0	95.3	251209.
25.717	321.0	109.7	5.1	83.2	96.3	252865.
27.150	319.3	110.7	5.3	81.5	94.6	254180.
27.700	317.8	112.0	5.3	81.5	94.5	254675.

RESULTS FROM THE MAIN EXCHANGER FOR THE THIRTIETH RUN
THIS RUN STARTED SEPTEMBER 13, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : ---
C. SILICA : 410 PPM
D. CARBONATE: 820 PPM
E. PH : 6.7
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER : THIS RUN HAD SCALE OUTSIDE OF THE TUBES

BRINE FLOW LB/HR	COOLH2O FLOW LB/HR	BRINE FLUX BTU/HR	COOLH2O FLUX BTU/HR	OVERALL HTC BTU/HRSQFTDEG F	RUN TIME HOURS
495.1	4192.1	105613.2	101346.8	321.7	.00
467.1	4167.1	96934.4	98476.8	283.0	1.68
467.5	7636.7	95401.6	118894.1	346.4	2.67
476.7	7604.9	97738.3	99425.1	186.2	3.73
495.3	7539.8	102881.0	100830.8	194.8	4.77
458.2	7609.0	93978.9	98718.7	173.0	5.43
475.2	7617.9	101350.1	102635.7	145.0	22.63
474.7	7541.9	99380.3	100106.1	118.2	23.90
475.2	7592.2	96741.7	99258.6	107.9	25.72
494.2	7448.6	99327.8	97381.3	101.9	27.15
494.6	7467.0	98064.1	96876.8	98.5	27.70

THIS IS THE INPUT DATA FOR THE THIRTY FIRST RUN
THIS RUN STARTED SEPTEMBER 27, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 5 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 6.8
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.3	6.4	6.4	6.4	250550.	97.1	110.3	89.3	97.1	84.5	89.3
.93	6.0	6.0	6.3	6.2	251407.	98.7	112.1	90.8	98.7	86.1	90.8
2.62	6.1	6.1	6.0	6.1	252970.	102.9	116.0	95.3	102.9	90.6	95.3
3.43	6.0	6.2	6.0	6.0	253730.	103.6	116.5	96.0	103.6	91.4	96.0
4.52	6.1	6.1	6.1	6.1	254740.	104.6	117.5	96.8	104.6	92.2	96.8
6.48	6.0	6.1	6.1	6.1	256562.	104.3	117.2	96.5	104.3	91.9	96.5
12.98	6.0	6.0	6.1	6.1	262617.	96.4	109.7	88.4	96.4	83.7	88.4
22.88	6.0	6.0	6.0	5.9	271818.	95.4	109.0	87.5	95.4	82.8	87.5
24.13	6.0	6.0	6.0	6.0	273019.	97.3	110.8	89.5	97.3	84.8	89.5
25.43	6.0	6.1	6.0	6.0	274199.	100.7	114.2	92.7	100.7	88.0	92.7
27.27	6.0	6.1	6.0	6.0	275900.	103.6	117.1	95.9	103.6	91.2	95.9
28.70	6.1	6.1	6.1	6.1	277224.	104.8	118.2	97.1	104.8	92.5	97.1
30.48	6.0	6.1	6.1	6.0	278867.	104.5	117.8	96.9	104.5	92.3	96.9
37.48	6.1	6.1	6.1	5.9	285360.	96.4	110.5	88.7	96.4	84.0	88.7
48.53	6.0	6.1	6.3	6.0	295532.	98.3	112.9	91.0	98.3	86.7	91.0
49.45	6.2	6.2	6.2	6.2	296375.	100.1	114.3	92.8	100.1	88.4	92.8
50.68	6.2	6.2	6.2	6.2	297510.	101.9	116.2	94.8	101.9	90.4	94.8
52.22	6.2	6.2	6.2	6.4	298917.	104.1	117.7	96.9	104.1	92.6	96.9
53.80	6.4	6.2	6.0	5.9	300370.	103.9	116.1	96.3	103.9	91.6	96.3

EXCHANGER NUMBER 1 TEMPS IN DEG. F						EXCHANGER NUMBER 2 TEMPS IN DEG. F					
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
314.0	231.0	314.0	227.0	314.0	231.0	318.3	217.0	231.0	178.0	227.0	178.0
315.0	232.0	316.0	230.0	316.0	232.0	309.5	217.6	232.0	179.0	230.0	180.0
316.0	235.0	316.0	232.0	316.0	231.0	309.2	219.3	235.0	182.0	232.0	183.0
316.0	235.0	316.0	231.0	316.0	232.0	308.8	219.5	235.0	183.0	231.0	183.0
317.0	236.0	317.0	231.0	317.0	232.0	309.3	220.0	236.0	184.0	231.0	184.0
318.0	236.0	317.0	231.0	319.0	232.0	310.0	220.5	236.0	184.0	231.0	184.0
313.0	234.0	314.0	230.0	314.0	231.0	309.1	217.6	234.0	181.0	230.0	181.0
311.0	236.0	312.0	232.0	313.0	232.0	310.7	216.5	236.0	183.0	232.0	184.0
310.0	237.0	311.0	234.0	311.0	234.0	311.5	217.6	237.0	185.0	234.0	185.0
310.0	237.0	310.0	237.0	311.0	236.0	312.3	219.3	237.0	189.0	237.0	189.0
309.0	240.0	309.0	237.0	309.0	237.0	310.7	219.3	240.0	190.0	237.0	190.0
305.0	242.0	305.0	240.0	305.0	239.0	310.0	219.3	242.0	193.0	240.0	193.0
306.0	242.0	307.0	240.0	307.0	238.0	309.7	218.2	242.0	193.0	240.0	193.0
298.0	241.0	301.0	237.0	298.0	237.0	308.9	213.6	241.0	192.0	237.0	192.0
308.0	214.0	309.0	212.0	308.0	213.0	308.0	213.0	214.0	167.0	212.0	169.0
308.0	216.0	309.0	213.0	308.0	212.0	308.6	214.2	216.0	169.0	213.0	169.0
309.0	216.0	310.0	214.0	310.0	212.0	309.1	215.2	216.0	169.0	214.0	169.0
310.0	220.0	311.0	218.0	310.0	215.0	309.6	218.1	220.0	173.0	218.0	173.0
309.0	228.0	310.0	225.0	309.0	225.0	308.1	224.2	228.0	179.0	225.0	180.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
178.0	147.0	178.0	146.0	177.0	149.0	166.9	143.9
179.0	147.0	180.0	148.0	179.0	151.0	167.9	145.0
182.0	151.0	183.0	151.0	179.0	152.0	170.5	147.7
183.0	152.0	183.0	151.0	179.0	152.0	170.8	148.1
184.0	153.0	184.0	152.0	181.0	153.0	171.5	148.9
184.0	153.0	184.0	152.0	181.0	154.0	171.9	149.0
181.0	149.0	181.0	145.0	179.0	151.0	167.8	144.4
183.0	153.0	184.0	151.0	180.0	153.0	167.0	143.3
185.0	154.0	185.0	153.0	181.0	154.0	168.2	144.5
189.0	158.0	189.0	157.0	183.0	157.0	170.4	146.9
190.0	160.0	190.0	159.0	187.0	160.0	171.6	148.4
193.0	165.0	193.0	164.0	188.0	165.0	171.9	148.9
193.0	165.0	193.0	163.0	189.0	164.0	170.8	148.0
192.0	164.0	192.0	162.0	187.0	164.0	165.5	142.4
167.0	137.0	169.0	139.0	165.0	138.0	165.0	142.6
169.0	139.0	169.0	140.0	164.0	138.0	166.4	143.7
169.0	140.0	169.0	141.0	164.0	139.0	167.6	145.3
173.0	142.0	173.0	143.0	167.0	142.0	169.6	147.2
179.0	146.0	180.0	147.0	173.0	145.0	171.6	148.3

RESULTS FROM THE THIRTY FIRST RUN

THIS RUN STARTED SEPTEMBER 27, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 5 PPM
- C. SILICA : 400 PPM
- D. CARBONATE: 800 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

FLOWRATES						MINI EXCHANGER NUMBER 1					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	OVERALL HEAT TRANSFER COEFFICIENTS					TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	HOURS
						BTU/HR. SQ. FT. DEG. F					
7578.3	288.7	310.9	306.8	288.5	.00	153.8	176.1	163.4	195.7	172.3	.00
7654.7	273.8	291.1	301.4	280.1	.93	153.4	169.9	170.6	186.3	170.0	.93
7675.3	278.6	296.0	286.3	275.3	2.62	154.5	172.1	169.1	183.3	169.3	2.62
7677.5	273.6	300.8	286.3	270.6	3.43	151.6	177.5	166.3	176.9	168.6	3.43
7635.0	278.5	295.8	291.2	275.3	4.52	152.7	175.6	170.1	180.8	169.8	4.52
7674.9	273.4	295.8	290.9	275.2	6.48	151.2	175.2	172.8	180.1	169.8	6.48
7668.7	274.0	291.4	291.6	275.3	12.98	145.8	166.9	164.4	182.2	164.8	12.98
7929.0	274.3	291.7	286.7	265.5	22.88	144.5	165.8	164.6	189.0	166.0	22.88
7488.0	274.4	291.8	286.9	270.2	24.13	139.0	157.2	154.6	188.7	159.9	24.13
7646.0	274.4	296.8	286.9	270.1	25.43	145.0	156.9	156.0	193.5	162.8	25.43
7612.4	274.6	297.0	287.2	270.3	27.27	140.5	160.3	155.1	197.8	163.4	27.27
7590.4	280.1	297.5	292.9	275.2	28.70	135.4	149.5	150.0	206.6	160.4	28.70
7641.3	275.0	297.2	292.6	270.4	30.48	133.3	151.5	154.7	203.7	160.8	30.48
7594.5	281.0	298.1	293.8	265.7	37.48	125.6	150.6	142.6	214.3	158.3	37.48
7580.6	274.7	297.0	302.6	270.7	48.53	188.9	211.9	211.2	188.9	200.2	48.53
7588.5	284.6	301.8	297.5	280.2	49.45	188.5	210.7	209.1	191.5	200.0	49.45
7558.3	284.5	301.7	297.2	280.1	50.68	192.1	211.6	214.7	191.4	202.5	50.68
7561.5	284.3	301.5	297.2	289.7	52.22	182.0	200.7	205.2	190.2	194.5	52.22
7631.1	294.4	301.7	287.2	265.8	53.80	165.2	179.3	169.2	157.2	167.7	53.80
MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
					HOURS						HOURS
148.8	150.4	161.9	158.7	154.9	.00	133.9	149.9	127.2	108.9	130.0	.00
146.6	147.4	161.4	159.3	153.7	.93	134.8	141.4	125.8	107.5	127.4	.93
150.2	148.4	156.4	156.3	152.8	2.62	136.7	149.0	123.5	109.7	129.7	2.62
145.6	150.1	160.8	154.9	152.8	3.43	132.6	151.7	123.7	107.0	128.7	3.43
150.2	147.1	159.2	159.8	154.1	4.52	133.0	147.1	127.9	107.3	128.8	4.52
147.8	147.4	159.4	159.5	153.5	6.48	131.2	147.8	122.8	108.8	127.6	6.48
143.6	143.3	153.3	156.0	149.1	12.98	125.4	154.7	116.3	103.3	124.9	12.98
143.0	139.0	151.1	152.6	146.4	22.88	117.5	138.7	112.3	106.2	118.7	22.88
135.1	136.9	148.7	150.0	142.6	24.13	118.4	130.9	110.2	105.8	116.3	24.13
130.4	141.1	156.0	156.0	145.9	25.43	119.0	133.8	108.5	107.7	117.3	25.43
135.5	139.3	145.7	154.1	143.6	27.27	118.0	132.8	112.9	109.9	118.4	27.27
132.7	136.2	149.9	156.3	143.8	28.70	110.7	122.7	97.7	114.7	111.4	28.70
130.9	136.7	144.3	156.1	142.0	30.48	107.7	126.5	105.3	112.4	113.0	30.48
126.1	124.6	139.9	150.7	135.3	37.48	102.8	118.3	90.5	108.9	105.1	37.48
151.9	149.6	173.9	155.6	157.8	48.53	146.5	153.2	145.8	103.6	137.3	48.53
155.5	156.4	174.7	159.6	161.6	49.45	153.2	155.5	145.1	109.9	140.9	49.45
155.8	159.6	175.3	157.4	162.0	50.68	153.7	155.8	144.9	111.7	141.6	50.68
152.8	156.5	173.7	165.6	162.1	52.22	156.8	159.3	137.8	112.3	141.5	52.22
155.5	147.3	169.2	160.4	158.1	53.80	160.7	162.2	139.5	105.2	141.9	53.80

THIS IS THE INPUT DATA FOR THE THIRTY SECOND RUN
 THIS RUN STARTED OCTOBER 5, 1978
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 30 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 5.0
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	6.3	6.2	6.4	6.6	302345.	90.4	104.9	81.8	90.4	76.7	81.8
1.02	6.5	6.5	6.4	6.4	303273.	93.9	108.5	85.1	93.9	79.9	85.1
2.55	6.5	6.4	6.6	6.5	304659.	96.2	110.4	87.5	96.2	82.2	87.5
4.22	6.4	6.5	6.3	6.6	306170.	97.4	110.0	88.5	97.4	83.0	88.5
5.08	6.4	6.4	6.5	6.4	306975.	97.5	109.7	89.4	97.5	83.7	89.4
5.83	6.4	6.4	6.5	6.4	307684.	98.6	110.8	90.1	98.6	84.9	90.1
11.47	6.5	6.3	6.4	6.4	312977.	91.8	101.5	83.2	91.8	77.1	83.2
22.15	6.3	6.3	6.4	6.4	323138.	88.1	96.8	80.4	88.1	74.4	80.4
23.20	6.3	6.4	6.4	6.3	324121.	87.6	96.5	80.0	87.6	74.2	80.0
24.13	6.4	6.3	6.2	6.3	325008.	89.3	98.4	81.6	89.3	76.0	81.6
25.12	6.3	6.2	6.2	6.3	325937.	92.0	101.2	84.2	92.0	78.8	84.2
27.78	6.4	6.4	6.4	6.4	328429.	97.7	106.6	89.3	97.7	83.3	89.3
28.80	6.5	6.4	6.5	6.4	329363.	97.9	106.8	89.4	97.9	83.3	89.4
29.62	6.5	6.4	6.4	6.5	330114.	98.1	107.2	89.2	98.1	82.9	89.2
34.87	6.4	6.5	6.5	6.5	334966.	92.9	101.4	84.0	92.9	77.2	84.0
45.33	6.5	6.5	6.4	6.5	344804.	93.2	100.8	84.8	93.2	77.9	84.8
47.77	6.5	6.5	6.5	6.5	346591.	93.9	101.4	85.6	93.9	78.5	85.6

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
318.0	224.0	318.0	225.0	318.0	224.0	317.6	222.8	224.0	168.0	225.0	170.0	224.0	171.0	222.8	165.4
319.0	228.0	320.0	230.0	319.0	226.0	318.7	224.8	228.0	171.0	230.0	174.0	226.0	172.0	224.8	168.1
320.0	229.0	320.0	231.0	320.0	227.0	318.2	227.0	229.0	173.0	231.0	176.0	227.0	173.0	227.0	170.8
318.0	240.0	318.0	237.0	318.0	235.0	318.2	233.2	240.0	182.0	237.0	182.0	235.0	180.0	233.2	174.4
318.0	240.0	319.0	238.0	318.0	235.0	317.9	233.4	240.0	182.0	238.0	182.0	235.0	179.0	233.4	175.2
318.0	241.0	319.0	238.0	319.0	236.0	317.7	233.2	241.0	183.0	238.0	183.0	236.0	180.0	233.2	175.4
318.0	256.0	319.0	254.0	319.0	249.0	317.6	252.5	256.0	197.0	254.0	199.0	249.0	193.0	252.5	190.7
314.0	256.0	314.0	254.0	314.0	253.0	313.2	254.3	256.0	204.0	254.0	205.0	253.0	202.0	254.3	197.7
314.0	254.0	315.0	251.0	314.0	251.0	313.2	252.0	254.0	203.0	251.0	200.0	251.0	200.0	252.0	195.5
314.0	255.0	315.0	250.0	315.0	250.0	313.5	250.5	255.0	203.0	250.0	198.0	250.0	200.0	250.5	195.0
317.0	258.0	318.0	252.0	318.0	253.0	316.7	253.0	258.0	205.0	252.0	198.0	253.0	202.0	253.0	198.1
319.0	266.0	320.0	260.0	320.0	260.0	319.2	260.2	266.0	212.0	260.0	204.0	260.0	208.0	260.2	205.6
319.0	266.0	320.0	260.0	320.0	260.0	318.7	260.7	266.0	211.0	260.0	203.0	260.0	208.0	260.7	205.3
319.0	266.0	320.0	261.0	320.0	260.0	318.9	260.9	266.0	211.0	261.0	203.0	260.0	208.0	260.9	204.7
320.0	268.0	321.0	264.0	321.0	261.0	320.3	263.1	268.0	211.0	264.0	205.0	261.0	206.0	263.1	204.0
315.0	268.0	316.0	266.0	316.0	263.0	314.6	263.3	268.0	213.0	266.0	210.0	263.0	211.0	263.3	206.6
316.0	270.0	317.0	268.0	317.0	265.0	315.7	265.3	270.0	216.0	268.0	212.0	265.0	212.0	265.3	208.5

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
168.0	136.0	170.0	137.0	171.0	138.0	165.4	142.8
171.0	140.0	174.0	141.0	172.0	140.0	168.1	144.0
173.0	142.0	176.0	143.0	173.0	143.0	170.8	145.5
182.0	147.0	182.0	147.0	180.0	145.0	174.4	150.1
182.0	147.0	182.0	147.0	179.0	146.0	175.2	149.6
183.0	148.0	183.0	148.0	180.0	147.0	175.6	150.5
197.0	156.0	199.0	158.0	193.0	156.0	190.7	158.0
204.0	162.0	205.0	165.0	202.0	163.0	197.7	166.5
203.0	161.0	200.0	160.0	200.0	161.0	195.5	164.6
203.0	162.0	198.0	159.0	200.0	161.0	195.0	163.4
205.0	165.0	198.0	160.0	202.0	164.0	198.1	167.9
212.0	172.0	204.0	165.0	208.0	170.0	205.6	174.1
211.0	171.0	203.0	163.0	208.0	170.0	205.3	173.2
211.0	170.0	203.0	162.0	208.0	169.0	204.7	172.8
211.0	166.0	205.0	159.0	206.0	163.0	204.0	166.7
213.0	169.0	210.0	162.0	211.0	164.0	206.6	169.7
216.0	170.0	212.0	163.0	212.0	166.0	208.5	170.0

RESULTS FROM THE THIRTY SECOND RUN
THIS RUN STARTED OCTOBER 5, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 30 PPM
- C. SILICA : 400 PPM
- D. CARBONATE: 800 PPM
- E. PH : 5.0
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

MINI EXCHANGER NUMBER 1										
FLOWRATES					OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
7536.4	288.2	300.5	306.2	298.1	.00	172.7	177.6	183.5	181.2	178.8
7461.9	297.9	314.8	306.1	288.4	1.02	174.3	180.4	184.4	176.3	178.9
7478.1	297.8	310.0	316.0	293.3	2.55	173.3	175.2	189.4	173.1	177.7
7669.6	293.1	315.1	301.2	298.0	4.22	143.0	161.3	159.1	162.2	156.4
7800.2	293.1	310.1	311.3	288.5	5.08	142.2	156.9	163.5	155.2	154.4
7750.2	293.1	310.1	311.1	288.5	5.83	140.6	157.7	163.2	156.1	154.4
7861.0	298.1	305.2	306.1	288.6	11.47	105.0	113.1	124.0	107.9	112.5
7744.7	288.7	306.0	306.8	289.2	22.15	92.9	102.4	104.7	95.1	98.8
7865.2	288.7	310.7	306.8	294.4	23.20	96.2	111.2	108.3	97.4	103.3
7815.7	293.7	305.8	296.5	284.3	24.13	97.4	113.1	109.7	102.1	105.6
7723.0	288.3	300.5	296.1	283.9	25.12	95.6	113.2	109.5	103.2	105.4
7582.6	293.0	310.0	305.9	288.3	27.78	88.0	107.0	105.6	98.0	99.6
7589.1	297.9	310.0	311.0	288.4	28.80	89.4	107.9	107.3	96.3	100.0
7629.6	297.9	310.0	305.9	293.2	29.62	91.0	106.7	107.4	99.5	101.2
7769.1	292.8	314.7	310.8	293.0	34.87	83.0	98.7	103.5	92.6	94.4
6066.8	298.5	315.4	306.5	293.8	45.33	69.0	77.9	80.9	75.2	75.7
7655.8	298.3	315.3	311.4	293.6	47.77	74.9	84.6	89.4	81.9	82.7

MINI EXCHANGER NUMBER 2										
OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
161.2	162.6	159.4	174.3	164.4	.00	143.9	151.7	152.4	101.1	137.3
168.9	171.1	164.7	167.5	168.1	1.02	143.4	157.2	151.1	106.3	139.5
166.6	166.2	171.8	168.1	168.2	2.55	145.7	157.2	148.4	115.2	141.6
159.2	164.1	159.6	175.4	164.6	4.22	148.8	160.0	157.0	107.1	143.2
153.6	158.0	163.0	161.3	159.0	5.08	155.4	164.4	159.5	113.9	148.3
157.3	159.5	166.8	164.8	162.1	5.83	147.6	156.2	151.4	106.6	140.4
137.3	130.8	139.2	144.8	138.0	11.47	142.8	143.2	134.8	112.1	133.2
110.4	110.5	117.0	124.1	115.5	22.15	127.1	125.7	125.8	94.7	118.3
108.9	119.7	118.2	123.3	117.6	23.20	126.9	132.4	126.8	93.0	119.8
114.8	124.0	114.6	124.4	119.4	24.13	126.7	130.4	123.9	89.9	117.7
114.7	127.9	116.6	122.4	120.4	25.12	120.2	126.3	119.4	95.5	114.1
118.1	136.3	122.8	122.7	125.0	27.78	122.5	136.1	125.0	96.4	120.0
122.4	138.9	124.5	124.1	127.5	28.80	125.7	141.9	127.0	98.8	123.4
125.1	144.0	125.2	131.1	131.3	29.62	130.6	147.4	129.9	101.1	127.2
120.7	139.0	128.6	130.5	129.7	34.87	135.1	158.3	142.2	114.8	137.6
104.5	114.4	103.7	110.1	108.2	45.33	116.7	141.6	132.6	98.4	122.3
112.1	125.4	118.2	121.0	119.2	47.77	135.1	160.6	146.4	114.6	139.2

THIS IS THE INPUT DATA FOR THE THIRTY THIRD RUN
THIS RUN STARTED OCTOBER 12, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 28 PPM
- C. SILICA : 400 PPM
- D. CARBONATE: 800 PPM
- E. PH : 6.0
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

FLOWS						COOLING WATER TEMPERATURES IN DEG. F					
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	6.5	6.5	6.5	6.4	348815.	89.2	103.8	80.5	89.2	75.3	80.5
1.02	6.5	6.5	6.5	6.4	349737.	89.8	104.1	80.9	89.8	75.7	80.9
1.82	6.5	6.5	6.5	6.5	350463.	89.5	103.6	80.8	89.5	75.5	80.8
3.05	6.5	6.5	6.5	6.5	351584.	88.0	101.8	79.2	88.0	73.9	79.2
4.25	6.6	6.5	6.5	6.5	352677.	90.0	103.4	81.2	90.0	75.8	81.2
4.95	6.6	6.5	6.5	6.5	353315.	90.9	104.2	82.2	90.9	76.9	82.2
7.42	6.7	6.4	6.3	6.4	355600.	89.2	102.1	80.4	89.2	75.0	80.4
12.18	6.2	6.5	6.4	6.5	359890.	87.8	100.2	78.6	87.8	72.8	78.6
23.03	5.7	5.1	6.1	6.0	369790.	77.2	85.6	68.5	77.2	62.9	68.5
28.98	6.2	6.3	6.6	7.0	375200.	89.5	97.1	81.3	89.5	74.2	81.3
31.57	5.7	5.9	5.9	6.4	377560.	89.4	96.5	81.6	89.4	74.4	81.6

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
318.0	221.0	318.0	230.0	318.0	228.0	317.3	225.3	221.0	175.0	230.0	172.0	228.0	170.0	225.3	163.2
320.0	234.0	320.0	233.0	321.0	230.0	319.8	227.7	234.0	177.0	233.0	174.0	230.0	172.0	227.7	165.6
317.0	224.0	316.0	233.0	317.0	229.0	315.8	226.9	224.0	177.0	233.0	174.0	229.0	171.0	226.9	165.5
317.0	225.0	316.0	234.0	317.0	231.0	316.1	227.9	225.0	178.0	234.0	175.0	231.0	172.0	227.9	165.8
317.0	228.0	317.0	235.0	318.0	232.0	316.9	230.4	228.0	180.0	235.0	177.0	232.0	174.0	230.4	168.3
317.0	228.0	316.0	235.0	317.0	232.0	315.8	230.7	228.0	181.0	235.0	178.0	232.0	174.0	230.7	169.2
314.0	230.0	314.0	235.0	315.0	229.0	313.1	229.3	230.0	181.0	235.0	179.0	229.0	173.0	229.3	169.2
318.0	236.0	317.0	241.0	319.0	238.0	316.9	234.8	236.0	185.0	241.0	184.0	238.0	178.0	234.8	175.5
316.0	250.0	315.0	253.0	316.0	256.0	316.3	254.0	250.0	189.0	253.0	186.0	256.0	191.0	254.0	187.9
319.0	270.0	319.0	272.0	320.0	272.0	319.8	273.7	270.0	219.0	272.0	215.0	272.0	220.0	273.7	222.0
318.0	271.0	318.0	273.0	319.0	273.0	317.6	273.3	271.0	222.0	273.0	219.0	273.0	223.0	273.3	224.7

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
175.0	136.0	172.0	138.0	170.0	138.0	163.2	139.5
177.0	138.0	174.0	140.0	172.0	140.0	165.6	140.7
177.0	138.0	174.0	139.0	171.0	140.0	165.5	140.3
178.0	138.0	175.0	140.0	172.0	140.0	165.8	140.1
180.0	140.0	177.0	142.0	174.0	142.0	168.3	142.8
181.0	141.0	178.0	142.0	174.0	143.0	169.2	143.3
181.0	141.0	179.0	143.0	173.0	142.0	169.2	142.7
185.0	142.0	184.0	145.0	178.0	145.0	173.5	145.1
189.0	144.0	186.0	145.0	191.0	151.0	187.9	149.2
219.0	171.0	215.0	169.0	220.0	179.0	222.0	177.8
222.0	172.0	219.0	171.0	223.0	182.0	224.7	179.1

RESULTS FROM THE THIRTY THIRD RUN
THIS RUN STARTED OCTOBER 12, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 28 PPM
- C. SILICA : 400 PPM
- D. CARBONATE: 800 PPM
- E. PH : 6.0
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

FLOWRATES						MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F		HOURS
7489.4	298.1	315.1	311.3	288.6	.00	185.8	172.6	175.6	168.3	175.6	.00
7496.5	297.8	314.8	310.8	288.2	1.02	157.7	169.3	176.2	167.2	167.6	1.02
7511.0	298.2	315.4	311.4	293.6	1.82	177.0	162.3	171.8	165.3	169.1	1.82
7527.5	298.2	315.4	311.4	293.5	3.05	172.2	157.7	164.6	161.2	163.9	3.05
7530.0	303.1	315.3	311.3	293.4	4.25	167.6	156.8	163.7	156.4	161.1	4.25
7651.0	303.1	315.4	311.4	293.6	4.95	170.0	157.5	164.5	156.4	162.1	4.95
7438.5	308.5	310.9	301.6	289.2	7.42	159.4	148.5	159.7	149.7	154.3	7.42
7545.2	283.3	315.3	306.1	293.4	12.18	138.7	141.1	146.8	144.8	142.9	12.18
7538.7	258.8	247.4	291.3	269.6	23.03	90.5	80.8	91.1	88.0	87.6	23.03
7555.0	283.1	305.2	316.0	316.9	28.98	74.9	77.1	81.3	78.0	77.8	28.98
7533.5	258.6	284.0	280.8	288.6	31.57	67.6	71.2	71.3	70.8	70.2	31.57

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F		HOURS
130.2	170.5	171.5	178.8	162.8	.00
150.8	168.2	166.8	173.1	164.7	1.02
130.0	169.7	169.8	176.2	161.4	1.82
127.5	166.5	168.7	175.1	159.5	3.05
132.0	164.3	166.6	174.5	159.3	4.25
130.7	163.3	169.4	174.7	159.5	4.95
136.1	155.5	158.9	166.8	154.3	7.42
125.1	153.7	163.3	165.5	151.9	12.18
115.1	121.3	134.6	129.0	125.0	23.03
96.9	117.9	109.4	107.8	108.0	28.98
87.8	107.5	96.4	95.7	96.9	31.57

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F		HOURS
144.9	152.1	143.0	101.0	140.2	.00
160.7	148.2	139.3	103.7	138.0	1.02
161.8	154.9	136.6	107.8	140.3	1.82
160.2	148.4	136.2	106.7	137.9	3.05
164.1	149.4	137.2	105.7	139.1	4.25
163.7	154.5	133.2	107.7	139.8	4.95
162.3	146.5	127.4	106.1	135.6	7.42
154.4	153.4	129.8	109.5	136.8	12.18
124.3	109.0	118.5	108.6	115.1	23.03
125.9	133.3	115.0	124.1	124.6	28.98
122.6	132.2	103.7	119.4	119.5	31.57

THIS IS THE INPUT DATA FOR THE THIRTY FOURTH RUN
THIS RUN STARTED OCTOBER 21, 1977
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 10.2
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.5	6.6	5.7	6.1	378886.	96.6	111.1	87.7	96.6	82.3	87.7
1.00	6.4	6.5	5.7	6.1	379700.	96.2	111.1	87.3	96.2	81.9	87.3
16.57	6.2	6.3	6.3	6.3	392715.	88.9	104.3	79.6	88.9	73.9	79.6
17.73	6.2	6.3	6.3	6.3	393680.	89.7	105.3	80.3	89.7	74.6	80.3
19.17	6.3	6.3	6.3	6.3	394866.	92.0	107.5	82.8	92.0	77.1	82.8
20.95	6.3	6.3	6.3	6.3	396352.	96.2	111.2	87.2	96.2	81.7	87.2
23.02	6.3	6.3	6.2	6.3	398058.	97.7	112.9	88.5	97.7	83.0	88.5
24.77	6.2	6.3	6.3	6.3	399502.	96.5	111.8	87.2	96.5	81.6	87.2

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
314.0	225.0	315.0	231.0	315.0	229.0	314.2	227.4	225.0	179.0	231.0	175.0	229.0	169.0	227.4	167.6
318.0	227.0	318.0	232.0	318.0	231.0	317.3	228.0	227.0	179.0	232.0	175.0	231.0	170.0	228.0	167.3
317.0	224.0	317.0	228.0	317.0	232.0	316.2	226.8	224.0	175.0	228.0	170.0	232.0	172.0	226.8	165.2
318.0	224.0	318.0	230.0	319.0	232.0	317.3	228.4	224.0	176.0	230.0	172.0	232.0	172.0	228.4	166.6
319.0	227.0	319.0	231.0	320.0	234.0	318.0	229.0	227.0	178.0	231.0	173.0	234.0	174.0	229.0	166.9
318.0	228.0	318.0	232.0	318.0	235.0	317.4	230.0	228.0	180.0	232.0	174.0	235.0	175.0	230.0	169.6
319.0	230.0	319.0	233.0	320.0	236.0	318.9	231.2	230.0	181.0	233.0	176.0	236.0	177.0	231.2	170.6
320.0	229.0	320.0	233.0	320.0	236.0	319.3	231.0	229.0	181.0	233.0	176.0	236.0	177.0	231.0	169.8

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
179.0	142.0	175.0	144.0	169.0	139.0	167.6	143.8
179.0	142.0	175.0	144.0	170.0	140.0	167.3	143.5
175.0	136.0	170.0	138.0	172.0	138.0	165.2	139.7
176.0	137.0	172.0	139.0	172.0	139.0	166.6	141.3
178.0	139.0	173.0	141.0	174.0	141.0	166.9	142.2
180.0	142.0	174.0	143.0	175.0	144.0	169.6	144.9
181.0	143.0	176.0	144.0	177.0	145.0	170.6	146.1
181.0	142.0	176.0	144.0	177.0	144.0	169.8	145.4

RESULTS FROM THE THIRTY FOURTH RUN
THIS RUN STARTED OCTOBER 21, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 10.2
F. ADDITIVE : NONE
I. LEVEL : NONE
G. OTHER :

FLOWRATES						MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
6714.7	298.6	320.4	271.2	274.7	.00	176.6	174.5	152.3	156.9	165.0	.00
6896.7	293.1	315.1	270.8	274.2	1.00	177.7	177.3	154.7	162.8	168.1	1.00
6836.3	283.4	305.5	301.3	284.0	16.57	170.2	173.1	160.8	162.6	166.7	16.57
6830.3	283.3	305.4	301.0	283.8	17.73	173.2	171.1	165.2	161.8	167.9	17.73
6879.9	288.0	305.2	300.9	283.7	19.17	172.9	172.8	164.3	164.0	168.5	19.17
6808.2	288.2	305.4	301.2	283.8	20.95	171.5	171.2	161.2	163.0	166.7	20.95
6808.0	288.0	305.2	295.8	283.6	23.02	171.0	173.2	161.8	165.2	167.8	23.02
6865.8	283.0	305.1	300.9	283.5	24.77	171.3	174.0	163.9	165.6	168.7	24.77

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
132.4	172.9	163.6	167.7	159.2	.00	162.7	147.2	130.5	191.5	135.5	.00
135.0	172.9	164.3	170.3	160.7	1.00	162.0	146.8	130.2	193.2	135.6	1.00
128.9	166.5	165.6	169.6	157.6	16.57	156.2	139.8	144.9	195.0	136.5	16.57
127.2	165.7	167.7	170.0	157.7	17.73	155.6	142.8	140.8	193.1	135.6	17.73
130.6	165.8	166.3	172.1	158.7	19.17	160.4	141.3	142.8	194.0	137.1	19.17
129.8	169.3	169.8	169.4	159.6	20.95	159.3	141.3	137.5	195.9	136.0	20.95
134.5	168.6	166.3	173.0	160.6	23.02	159.1	144.9	138.5	194.6	136.8	23.02
129.8	168.2	168.9	175.3	160.6	24.77	159.8	143.0	144.6	194.0	137.9	24.77

THIS IS THE INPUT DATA FOR THE THIRTY FIFTH RUN
 THIS RUN STARTED NOVEMBER 2, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 34 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 7.0
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	6.4	6.4	6.4	6.4	400774.	79.1	91.9	71.0	79.1	66.1	71.0
1.08	6.4	6.4	6.3	6.4	401731.	82.2	94.9	73.8	82.2	68.7	73.8
2.57	6.4	6.3	6.3	6.3	403121.	84.8	95.8	76.8	84.8	71.2	76.8
3.55	6.4	6.4	6.3	6.3	404012.	86.4	96.7	78.4	86.4	72.9	78.4
5.52	6.4	6.4	6.5	6.5	405786.	86.3	95.0	79.0	86.3	73.6	79.0
6.48	6.4	6.4	6.4	6.4	406658.	84.6	92.3	77.7	84.6	72.6	77.7
10.30	6.4	6.4	6.4	6.4	410123.	75.2	81.2	69.4	75.2	64.7	69.4

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
304.0	214.0	304.0	220.0	305.0	223.0	304.4	220.5	214.0	169.0	220.0	165.0	223.0	164.0	220.5	160.5
308.0	219.0	308.0	225.0	308.0	227.0	307.5	224.6	219.0	173.0	225.0	170.0	227.0	168.0	224.6	164.7
310.0	237.0	310.0	240.0	310.0	239.0	309.5	237.8	237.0	177.0	240.0	178.0	239.0	174.0	237.8	182.2
313.0	248.0	313.0	251.0	314.0	247.0	313.2	247.8	248.0	197.0	251.0	198.0	247.0	193.0	247.8	195.3
314.0	260.0	314.0	264.0	315.0	259.0	314.2	261.3	260.0	213.0	264.0	217.0	259.0	211.0	261.3	214.6
314.0	265.0	314.0	268.0	315.0	263.0	313.0	265.0	265.0	222.0	268.0	225.0	263.0	218.0	265.0	221.2
314.0	274.0	314.0	278.0	315.0	273.0	313.9	276.7	274.0	240.0	278.0	242.0	273.0	236.0	276.7	239.4

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
167.0	130.0	165.0	132.0	164.0	132.0	160.6	134.2
173.0	135.0	170.0	137.0	168.0	136.0	164.7	138.0
177.0	146.0	178.0	152.0	174.0	150.0	182.2	151.3
197.0	158.0	198.0	163.0	193.0	159.0	195.3	163.0
213.0	176.0	217.0	182.0	211.0	179.0	214.6	181.7
222.0	186.0	225.0	190.0	218.0	186.0	221.2	189.0
240.0	205.0	242.0	210.0	236.0	205.0	239.4	209.3

RESULTS FROM THE THIRTY FIFTH RUN
 THIS RUN STARTED NOVEMBER 2, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 34 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 7.0
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
7317.3	295.1	312.3	308.1	290.4	.00	163.1	157.8	150.1	146.1	154.3	.00
7751.6	289.6	311.7	302.6	290.0	1.08	162.5	159.8	150.4	148.8	153.4	1.08
7499.9	294.2	306.6	302.3	284.9	2.57	127.4	126.1	126.5	121.0	125.2	2.57
7461.1	293.8	311.0	301.7	284.4	3.55	110.7	110.8	117.3	107.8	111.7	3.55
7470.3	293.7	310.9	311.7	293.8	5.52	88.7	86.0	97.7	86.6	89.7	5.52
7516.5	293.7	310.9	306.7	289.2	6.48	77.7	76.6	86.4	75.1	78.9	6.48
7532.2	293.7	310.9	306.7	289.1	10.30	58.4	55.1	64.0	53.1	57.7	10.30

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	
118.3	152.8	160.8	158.1	147.5	149.5	134.7	129.6	101.0	128.7	.00
123.1	157.4	164.4	164.2	152.3	156.6	137.2	131.5	105.5	132.7	1.08
141.2	149.7	158.4	123.2	143.1	128.9	107.9	101.4	117.2	113.9	2.57
114.1	123.9	126.6	114.6	119.8	121.7	111.9	110.2	95.5	109.8	3.55
95.5	98.5	104.6	94.0	98.2	98.6	94.6	89.9	84.9	92.0	5.52
84.1	87.4	93.6	84.6	87.4	86.5	86.7	81.5	75.5	82.5	6.48
58.9	65.0	67.8	63.3	63.8	68.8	65.1	64.4	57.5	63.9	10.30

THIS IS THE INPUT DATA FOR THE THIRTY SIXTH RUN
 THIS RUN STARTED NOVEMBER 8, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 34.4 PPM
 C. SILICA : NONE
 D. CARBONATE: NONE
 E. PH : 10.2
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.2	6.2	6.3	6.2	414898.	71.1	78.6	67.0	71.1	64.8	67.0
.87	6.2	6.3	6.3	6.3	416546.	74.7	82.5	70.5	74.7	68.2	70.5
2.18	6.3	6.3	6.3	6.3	419087.	79.5	87.2	75.4	79.5	73.1	75.4
8.73	6.0	6.0	6.6	6.6	431840.	75.3	83.1	71.1	75.3	68.9	71.1
17.88	6.3	6.3	6.2	6.3	449734.	71.1	78.3	67.3	71.1	65.1	67.3
20.48	6.3	6.3	6.3	6.3	454924.	72.1	79.0	68.3	72.1	66.2	68.3
22.62	6.3	6.3	6.3	6.3	459199.	74.3	81.1	70.4	74.3	68.4	70.4
25.83	6.2	6.3	6.3	6.3	465616.	73.9	81.0	70.0	73.9	67.9	70.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
309.0	208.0	309.0	208.0	310.0	207.0	307.1	206.4	208.0	152.0	208.0	150.0	207.0	150.0	206.4	148.4
316.0	211.0	316.0	212.0	316.0	212.0	315.4	211.5	211.0	154.0	212.0	153.0	212.0	152.0	211.5	152.2
318.0	214.0	318.0	215.0	318.0	216.0	317.9	214.9	214.0	157.0	215.0	156.0	216.0	157.0	214.9	155.9
320.0	214.0	320.0	213.0	320.0	217.0	319.0	214.5	214.0	155.0	213.0	152.0	217.0	156.0	214.5	154.6
305.0	205.0	306.0	206.0	306.0	206.0	303.8	203.4	205.0	150.0	206.0	149.0	206.0	148.0	203.4	146.4
302.0	204.0	303.0	205.0	302.0	205.0	300.7	202.5	204.0	150.0	205.0	149.0	205.0	147.0	202.5	146.2
302.0	204.0	303.0	206.0	303.0	206.0	301.1	203.7	204.0	151.0	206.0	150.0	206.0	148.0	203.7	147.8
306.0	207.0	306.0	208.0	307.0	208.0	305.0	206.2	207.0	152.0	208.0	151.0	208.0	150.0	206.2	149.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
152.0	117.0	150.0	119.0	150.0	121.0	148.4	121.4
154.0	119.0	153.0	122.0	152.0	123.0	152.2	124.7
157.0	122.0	156.0	124.0	157.0	126.0	155.9	128.6
155.0	119.0	152.0	121.0	156.0	125.0	154.6	127.4
150.0	116.0	149.0	118.0	148.0	119.0	146.4	120.3
150.0	116.0	149.0	118.0	147.0	118.0	146.2	120.2
151.0	117.0	150.0	120.0	148.0	120.0	147.8	121.9
152.0	118.0	151.0	120.0	150.0	121.0	149.0	122.6

RESULTS FROM THE THIRTY SIXTH RUN
 THIS RUN STARTED NOVEMBER 8, 1977
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 31,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 34.4 PPM
 C. SILICA : NONE
 D. CARBONATE: NONE
 E. PH : 10.2
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER :

FLOW RATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE
15781.8	284.5	301.8	302.3	280.4	.00	174.1	184.7	188.9	172.7	180.1
16018.8	283.5	305.7	301.4	284.1	.87	181.6	173.3	190.6	180.0	186.4
16137.9	288.2	305.4	301.2	283.7	2.18	185.5	194.0	188.8	180.4	187.2
16227.8	273.1	290.5	316.0	297.9	8.73	174.1	187.6	193.9	187.3	185.7
16574.5	290.0	307.2	297.8	285.7	17.88	180.0	189.6	183.8	179.5	183.2
16584.7	290.4	307.6	303.5	286.1	20.48	177.2	186.6	182.6	176.3	180.7
16589.3	290.4	307.6	303.3	286.0	22.62	178.6	185.5	182.9	175.4	180.6
16294.8	284.9	307.2	302.7	285.5	25.83	174.8	185.9	184.7	175.7	180.3

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS				
TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE
155.6	172.9	170.9	163.1	165.6	157.6	147.3	135.7	117.9	139.6
160.1	179.0	180.5	168.3	172.0	164.9	154.2	141.9	124.8	146.5
164.5	180.8	176.6	168.1	172.5	171.0	163.6	152.4	124.5	152.9
156.8	176.0	184.4	173.7	172.7	159.6	146.3	149.8	122.5	144.6
157.4	173.1	171.7	165.1	166.8	164.7	157.2	142.2	122.7	146.7
157.4	173.2	179.1	166.3	169.0	163.4	155.9	145.8	121.5	146.7
159.4	178.0	184.0	169.0	172.6	164.0	150.0	139.9	120.1	143.5
156.4	175.1	176.6	166.4	168.6	158.4	153.9	141.5	120.6	143.6

THIS IS THE INPUT DATA FOR THE THIRTY SEVENTH RUN
THIS RUN STARTED DECEMBER 7, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 32 PPM
- C. SILICA : 420 PPM
- D. CARBONATE: 840 PPM
- E. PH : 6.9
- F. ADDITIVE : NONE
- 1. LEVEL : NONE

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- G. OTHER : THIS RUN HAD THE PROGRESSIVE ELECTRONIC WATER TREATER INSTALLED

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.3	6.4	6.4	6.4	467057.	75.2	87.3	66.6	75.2	61.1	66.6
3.17	6.9	6.8	6.8	6.8	469804.	78.6	88.2	70.1	78.6	64.2	70.1
4.17	6.9	6.9	6.9	6.9	470670.	78.0	87.5	70.5	78.0	65.0	70.5
4.98	7.0	7.0	7.0	7.0	471379.	77.9	86.6	70.8	77.9	65.7	70.8
5.73	7.3	7.3	7.3	7.3	472031.	76.5	85.0	69.7	76.5	64.7	69.7
6.67	7.6	7.7	7.6	7.5	472860.	75.7	83.7	69.1	75.7	64.3	69.1

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
296.0	211.0	296.0	221.0	296.0	223.0	293.2	219.2	211.0	167.0	221.0	166.0	223.0	166.0	219.2	163.9
308.0	245.0	308.0	246.0	308.0	246.0	305.4	244.0	245.0	191.0	246.0	197.0	246.0	197.0	244.0	196.9
308.0	247.0	308.0	250.0	308.0	249.0	305.4	247.7	247.0	199.0	250.0	202.0	249.0	202.0	247.7	203.0
307.0	251.0	308.0	254.0	308.0	253.0	305.5	251.5	251.0	205.0	254.0	209.0	253.0	209.0	251.5	209.3
308.0	254.0	308.0	256.0	309.0	256.0	305.7	254.6	254.0	209.0	256.0	213.0	256.0	214.0	254.6	214.2
309.0	256.0	309.0	260.0	309.0	260.0	306.2	257.3	256.0	215.0	260.0	219.0	260.0	218.0	257.3	218.2

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
167.0	130.0	166.0	132.0	166.0	134.0	163.9	134.1
193.0	152.0	197.0	159.0	197.0	163.0	196.9	162.1
199.0	160.0	202.0	166.0	202.0	170.0	203.0	169.7
205.0	169.0	209.0	175.0	209.0	176.0	209.3	177.7
209.0	174.0	213.0	180.0	214.0	184.0	214.2	183.8
215.0	181.0	219.0	187.0	218.0	190.0	218.2	188.6

RESULTS FROM THE THIRTY SEVENTH RUN

THIS RUN STARTED DECEMBER 7, 1977

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 32 PPM
- C. SILICA : 420 PPM
- D. CARBONATE: 840 PPM
- E. PH : 6.9
- F. ADDITIVE : NONE
- 1. LEVEL : NONE

- G. OTHER : THIS RUN HAD THE PROGRESSIVE ELECTRONIC WATER TREATER INSTALLED

MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS										AVERAGE	TIME HOURS
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR.	TUBE2 BTU/HR.	TUBE3 BTU/HR.	TUBE4 BTU/HR.		
7189.1	291.2	313.5	309.5	291.9	.00	154.7	142.0	135.5	132.1	141.1	.00
7176.4	319.3	331.3	328.0	309.5	3.17	106.2	108.1	107.0	101.2	105.6	3.17
7201.2	319.3	336.2	333.1	314.3	4.17	103.5	102.7	103.8	96.7	101.7	4.17
7206.3	324.4	341.0	338.2	319.1	4.98	94.1	94.4	95.6	89.4	93.4	4.98
7359.9	339.2	355.7	353.3	333.5	5.73	92.9	93.4	94.3	86.8	91.8	5.73
7219.4	353.9	375.0	368.5	343.0	6.67	90.9	88.2	86.6	81.5	86.8	6.67

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					AVERAGE	TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	BTU/HR. SQ.FT. DEG. F		
116.7	152.4	154.8	145.1	142.2	116.7	.00
123.0	118.0	116.8	106.6	116.1	123.0	3.17
105.6	109.0	106.1	95.2	104.0	105.6	4.17
98.9	99.3	96.6	87.7	95.6	98.9	4.98
96.8	95.1	92.0	83.8	91.9	96.8	5.73
87.3	90.3	91.2	79.6	87.1	87.3	6.67

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					AVERAGE	TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	BTU/HR. SQ.FT. DEG. F		
138.7	136.0	124.6	110.6	127.5	138.7	.00
128.1	116.7	101.3	98.3	111.1	128.1	3.17
113.2	105.5	91.2	89.3	99.8	113.2	4.17
98.0	93.3	83.2	80.1	88.7	98.0	4.98
94.6	89.9	79.5	76.1	85.0	94.6	5.73
88.1	84.7	72.2	71.4	79.1	88.1	6.67

THIS IS THE INPUT DATA FOR THE THIRTY EIGHTH RUN
THIS RUN STARTED DECEMBER 14, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 32 PPM
C. SILICA : 415 PPM
D. CARBONATE: 830 PPM
E. PH : 7.8
F. ADDITIVE : VERSENE 100
I. LEVEL : 10% EXCESS
G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	7.0	7.0	7.3	7.3	487343.	71.3	86.1	62.6	71.3	57.2	62.6
1.12	7.2	7.2	7.1	7.1	488302.	75.4	80.1	66.5	75.4	61.1	66.5
2.90	6.9	7.2	7.0	7.1	489722.	81.1	93.6	71.9	81.1	66.0	71.9
5.10	6.8	7.0	6.8	7.0	491625.	83.9	93.8	75.3	83.9	68.7	75.3
6.75	6.7	6.7	6.7	6.8	493033.	84.1	93.8	75.8	84.1	68.5	75.8
23.22	6.4	6.4	6.4	6.4	507582.	70.0	77.3	64.0	70.0	57.7	64.0
26.02	6.5	6.4	6.4	6.5	510045.	77.2	84.3	71.3	77.2	65.0	71.3
28.73	6.6	6.4	6.4	6.6	512397.	79.5	86.5	73.6	79.5	67.3	73.6
30.88	6.5	6.5	6.6	6.5	514295.	79.4	86.4	73.5	79.4	67.1	73.5
38.30	6.6	6.7	6.3	6.3	520770.	72.9	79.5	67.1	72.9	60.8	67.1

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
304.0	210.0	304.0	211.0	304.0	212.0	301.9	211.8	210.0	157.0	211.0	156.0	212.0	159.0	211.8	152.4
309.0	214.0	309.0	216.0	309.0	216.0	305.6	214.3	214.0	160.0	216.0	161.0	216.0	162.0	214.3	155.4
310.0	228.0	310.0	230.0	310.0	231.0	307.7	229.1	228.0	173.0	230.0	173.0	231.0	175.0	229.1	170.8
309.0	242.0	309.0	243.0	309.0	242.0	306.2	241.8	242.0	189.0	243.0	188.0	242.0	192.0	241.8	185.3
313.0	253.0	313.0	253.0	313.0	256.0	310.1	252.0	253.0	204.0	253.0	202.0	256.0	207.0	252.0	199.4
309.0	262.0	309.0	262.0	309.0	263.0	307.4	262.6	262.0	226.0	262.0	225.0	263.0	227.0	262.6	223.5
310.0	265.0	310.0	265.0	310.0	266.0	308.8	265.7	265.0	230.0	265.0	229.0	266.0	231.0	265.7	227.6
308.0	264.0	308.0	264.0	308.0	266.0	306.0	264.3	264.0	230.0	264.0	228.0	266.0	231.0	264.3	227.2
306.0	263.0	306.0	263.0	306.0	265.0	304.7	263.0	263.0	228.0	263.0	227.0	265.0	231.0	263.0	226.0
300.0	257.0	300.0	258.0	300.0	259.0	297.4	256.3	257.0	223.0	258.0	224.0	259.0	223.0	256.3	219.2

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
157.0	121.0	156.0	122.0	159.0	127.0	152.4	125.4
160.0	125.0	161.0	127.0	162.0	130.0	155.4	127.5
173.0	135.0	173.0	136.0	175.0	139.0	170.8	136.9
189.0	145.0	188.0	146.0	192.0	150.0	185.3	146.6
204.0	159.0	202.0	160.0	207.0	164.0	199.4	160.6
226.0	183.0	225.0	185.0	227.0	188.0	223.5	186.7
230.0	188.0	229.0	189.0	231.0	191.0	227.6	190.7
230.0	189.0	228.0	189.0	231.0	191.0	227.2	191.0
228.0	187.0	227.0	189.0	231.0	191.0	226.0	189.4
223.0	181.0	224.0	185.0	223.0	184.0	219.2	181.8

RESULTS FROM THE THIRTY EIGHTH RUN

THIS RUN STARTED DECEMBER 14, 1977

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 32 PPM
C. SILICA : 415 PPM
D. CARBONATE: 830 PPM
E. PH : 7.8
F. ADDITIVE : VERSENE 100
I. LEVEL : 10% EXCESS
G. OTHER :

MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS											AVERAGE	TIME HOURS
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT.	TUBE2 BTU/HR. SQ.FT.	TUBE3 BTU/HR. SQ.FT.	TUBE4 BTU/HR. SQ.FT.	DEG. F		
7117.6	324.9	341.7	354.1	334.1	.00	175.9	182.4	186.4	173.2	179.5	179.5	.00
6610.4	334.0	350.6	343.1	323.9	1.12	118.7	121.2	118.6	111.3	117.5	117.5	1.12
7160.4	319.0	350.5	337.9	323.6	2.90	146.7	156.2	148.3	142.9	148.5	148.5	2.90
7063.5	314.2	340.9	327.9	319.0	5.10	112.2	119.5	117.0	110.2	114.7	114.7	5.10
7313.4	308.7	325.6	322.2	308.8	6.75	102.1	107.7	100.4	99.8	102.5	102.5	6.75
7305.3	294.4	311.6	307.5	290.0	23.22	69.7	73.8	71.1	65.6	70.0	70.0	23.22
7181.8	299.2	311.4	307.4	294.6	26.02	69.2	72.0	69.3	65.3	68.9	68.9	26.02
7318.0	304.4	311.7	307.7	299.8	28.73	71.0	72.7	68.1	66.5	69.6	69.6	28.73
7236.9	299.8	316.9	318.2	295.2	30.88	68.8	72.8	69.3	65.9	69.2	69.2	30.88
7245.0	305.6	327.6	303.8	286.5	38.30	68.4	71.4	64.5	61.7	66.5	66.5	38.30

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
148.6	162.5	159.2	174.4	161.2	.00	152.6	151.3	139.9	116.8	140.1	.00
152.7	161.2	154.1	165.4	158.4	1.12	148.0	147.8	132.4	115.1	135.8	1.12
145.8	164.9	154.2	157.9	155.7	2.90	146.7	155.8	141.7	132.4	144.2	2.90
125.4	141.4	121.9	138.1	131.7	5.10	148.7	153.7	141.6	133.6	144.4	5.10
108.4	120.0	110.8	118.9	114.5	6.75	139.1	137.3	133.6	121.2	132.8	6.75
64.4	70.3	66.9	69.3	67.7	23.22	94.0	92.2	87.2	78.8	88.0	23.22
64.5	69.3	65.9	69.6	67.3	26.02	94.0	93.1	90.6	81.1	89.7	26.02
65.6	71.6	67.7	71.1	69.0	28.73	95.8	94.0	93.5	83.4	91.7	28.73
66.6	72.6	67.6	69.7	69.1	30.88	95.8	93.4	96.7	83.9	92.5	30.88
65.4	69.7	68.5	67.8	67.9	38.30	98.4	96.1	89.7	82.9	91.8	38.30

THIS IS THE INPUT DATA FOR THE THIRTY NINTH RUN
THIS RUN STARTED DECEMBER 21, 1977
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 30.000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 32 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 8.4
F. ADDITIVE : VERSENE 100
I. LEVEL : 50% EXCESS
G. OTHER :

FLOWS						COOLING WATER TEMPERATURES IN DEG. F					
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1	EXCH 2	EXCH 3	EXCH 1	EXCH 2	EXCH 3
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	6.2	6.2	6.2	6.2	523480.	70.9	84.8	62.6	70.9	57.5	62.6
.80	6.2	6.2	6.3	6.3	524180.	71.1	84.2	62.3	71.1	57.1	62.3
7.70	6.8	6.2	5.8	5.8	530130.	65.3	74.9	56.2	65.3	48.7	56.2
16.70	6.2	6.2	6.2	6.2	537845.	62.6	71.5	55.0	62.6	47.5	55.0
18.67	6.2	6.2	6.2	6.2	539541.	67.0	75.6	59.7	67.0	52.7	59.7
20.13	6.4	6.3	6.1	6.0	540770.	70.5	78.9	63.7	70.5	57.0	63.7
22.20	6.3	6.3	6.3	6.3	542548.	72.7	80.7	66.0	72.7	59.4	66.0
22.82	6.4	6.3	6.3	6.3	543084.	72.4	80.0	65.7	72.4	59.0	65.7
23.70	6.4	6.3	6.3	6.3	543845.	72.2	79.6	65.4	72.2	58.8	65.4
24.40	6.4	6.3	6.3	6.3	544447.	72.7	79.9	66.0	72.7	59.2	66.0
24.73	6.5	6.3	6.3	6.2	544730.	72.3	79.5	65.6	72.3	58.8	65.6
30.28	6.7	6.2	6.4	5.9	549490.	68.2	74.4	61.9	68.2	55.2	61.9
40.70	6.3	6.3	6.2	6.3	558550.	68.9	75.1	63.0	68.9	56.5	63.0
43.45	6.3	6.3	6.2	6.3	560892.	71.6	77.6	65.7	71.6	59.5	65.7
45.23	6.3	6.3	6.2	6.3	562426.	76.8	82.5	71.2	76.8	65.1	71.2
47.00	6.3	6.3	6.2	6.3	563930.	79.6	85.2	74.1	79.6	68.0	74.1

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
296.0	206.0	296.0	207.0	296.0	207.0	293.1	207.8	206.0	157.0	207.0	153.0	207.0	153.0	207.8	150.4
297.0	209.0	297.0	212.0	297.0	213.0	292.6	209.9	209.0	157.0	212.0	156.0	213.0	156.0	209.9	153.7
306.0	249.0	307.0	246.0	307.0	242.0	303.9	240.7	249.0	179.0	246.0	187.0	242.0	181.0	240.7	179.8
307.0	251.0	307.0	252.0	308.0	250.0	305.9	248.8	251.0	206.0	252.0	204.0	250.0	201.0	248.8	197.6
309.0	254.0	309.0	254.0	309.0	252.0	307.3	252.5	254.0	211.0	254.0	209.0	252.0	206.0	252.5	206.0
303.0	251.0	303.0	251.0	303.0	248.0	300.7	248.0	251.0	208.0	251.0	205.0	248.0	205.0	248.0	203.6
301.0	252.0	302.0	252.0	302.0	250.0	298.7	249.2	252.0	212.0	252.0	211.0	250.0	208.0	249.2	206.9
301.0	253.0	301.0	254.0	301.0	251.0	298.3	250.4	253.0	214.0	254.0	212.0	251.0	210.0	250.4	208.1
302.0	253.0	302.0	256.0	302.0	253.0	299.1	252.3	253.0	216.0	256.0	214.0	253.0	212.0	252.3	209.1
301.0	256.0	301.0	256.0	302.0	254.0	298.5	252.3	256.0	215.0	256.0	215.0	254.0	213.0	252.3	209.7
302.0	257.0	302.0	257.0	302.0	255.0	299.0	253.0	257.0	218.0	257.0	216.0	255.0	214.0	253.0	210.1
298.0	259.0	298.0	259.0	299.0	257.0	294.9	253.4	259.0	222.0	259.0	219.0	257.0	219.0	253.4	211.3
307.0	267.0	307.0	268.0	307.0	266.0	304.9	266.2	267.0	233.0	268.0	232.0	266.0	230.0	266.2	228.5
307.0	269.0	307.0	269.0	308.0	267.0	304.5	266.4	269.0	234.0	269.0	234.0	267.0	232.0	266.4	229.2
303.0	266.0	303.0	267.0	303.0	264.0	300.1	263.3	266.0	235.0	267.0	233.0	264.0	231.0	263.3	227.3
302.0	266.0	302.0	267.0	302.0	264.0	299.0	262.9	266.0	234.0	267.0	234.0	264.0	231.0	262.9	227.5

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
157.0	121.0	153.0	122.0	153.0	123.0	150.4	121.5
157.0	121.0	156.0	123.0	156.0	124.0	153.7	122.5
179.0	144.0	187.0	138.0	181.0	135.0	174.8	134.6
206.0	159.0	204.0	158.0	201.0	154.0	197.6	148.6
211.0	166.0	209.0	165.0	206.0	161.0	206.0	159.8
208.0	168.0	205.0	167.0	205.0	162.0	203.6	159.5
212.0	170.0	211.0	169.0	208.0	165.0	206.9	162.4
214.0	171.0	212.0	170.0	210.0	167.0	208.1	163.5
216.0	173.0	214.0	172.0	212.0	168.0	209.1	163.9
215.0	174.0	215.0	172.0	213.0	169.0	209.7	164.3
218.0	175.0	216.0	173.0	214.0	170.0	210.1	164.4
222.0	178.0	219.0	175.0	219.0	173.0	211.3	164.5
233.0	192.0	232.0	191.0	230.0	188.0	228.5	183.0
234.0	194.0	234.0	194.0	232.0	189.0	229.2	185.0
233.0	195.0	233.0	194.0	231.0	189.0	227.3	184.0
234.0	196.0	234.0	195.0	231.0	190.0	227.5	184.6

RESULTS FROM THE THIRTY NINTH RUN
THIS RUN STARTED DECEMBER 21, 1977
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : 32 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 8.6
F. ADDITIVE : VERSENE 100
1. LEVEL : 50% EXCESS
G. OTHER :

MINI EXCHANGER NUMBER 1											
FLOW RATES					OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
7246.8	286.3	303.7	299.2	282.3	.00	163.5	170.9	162.4	152.8	163.9	.00
7151.6	286.1	303.6	304.2	287.2	.80	154.3	156.5	154.4	146.5	152.9	.80
7123.3	314.7	302.1	277.3	261.6	7.70	92.8	95.9	94.8	87.8	92.9	7.70
7158.0	284.8	302.1	297.5	280.6	16.70	80.8	84.0	87.5	81.8	83.5	16.70
6993.2	284.5	301.8	297.4	280.4	18.67	78.5	83.3	85.5	77.7	81.2	18.67
7131.1	275.2	307.6	293.1	271.6	20.13	81.5	84.9	86.3	77.0	82.4	20.13
7174.7	290.5	307.7	303.5	286.4	22.20	76.2	82.2	84.8	76.9	80.0	22.20
7178.0	295.5	307.9	303.6	286.4	22.82	75.0	76.3	80.7	73.4	76.3	22.82
7138.9	295.4	307.7	303.5	286.3	23.70	75.4	73.2	77.5	70.4	74.1	23.70
7118.3	295.5	307.9	303.5	286.4	24.40	69.2	72.1	76.0	69.9	71.8	24.40
7119.6	300.3	307.7	303.5	281.5	24.73	70.1	71.8	74.4	68.3	71.1	24.73
7225.1	310.9	303.4	309.0	267.5	30.28	61.5	60.0	66.0	57.5	61.3	30.28
7075.8	289.7	307.0	297.7	285.5	40.70	56.8	58.6	60.0	54.5	57.5	40.70
7156.7	289.7	307.0	297.5	285.6	43.45	54.4	57.6	60.4	54.4	56.7	43.45
7049.4	290.3	307.6	298.2	286.2	45.23	54.5	56.1	59.4	54.2	56.1	45.23
7136.2	290.4	307.7	298.4	286.3	47.00	54.5	56.0	59.4	54.6	56.1	47.00

MINI EXCHANGER NUMBER 2											
OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3						
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
					HOURS		BTU/HR. SQ.FT.	DEG. F			HOURS
131.4	156.3	154.0	156.2	149.5	.00	143.7	133.2	126.0	117.5	130.1	.00
138.1	157.0	159.5	152.0	151.7	.80	139.3	134.2	129.4	122.0	131.2	.80
149.8	118.5	116.4	110.5	123.8	7.70	113.3	152.4	136.9	127.8	132.6	7.70
80.7	91.7	93.6	93.6	89.9	16.70	110.0	115.5	119.6	122.0	116.8	16.70
77.4	86.5	88.5	84.3	84.2	18.67	102.0	106.9	110.8	107.8	106.9	18.67
82.4	92.8	83.4	80.2	84.7	20.13	100.4	100.6	111.3	107.5	105.0	20.13
76.7	83.6	85.8	82.1	82.0	22.20	99.9	106.6	110.8	109.7	106.8	22.20
75.3	84.8	82.9	81.4	81.1	22.82	102.8	105.8	109.0	107.1	106.7	22.82
71.4	84.4	82.4	82.9	80.3	23.70	99.5	102.4	106.4	108.1	104.6	23.70
77.8	81.1	80.9	80.5	80.1	24.40	96.7	106.6	109.7	110.3	105.8	24.40
74.5	80.8	80.6	79.7	78.9	24.73	100.7	104.7	107.8	107.9	105.3	24.73
70.2	74.8	72.7	72.1	72.5	30.28	100.0	99.7	107.0	100.3	101.7	30.28
57.6	64.6	63.3	63.9	62.4	40.70	81.1	86.5	87.4	92.9	87.0	40.70
60.4	64.0	62.7	64.5	62.9	43.45	78.9	83.6	89.3	90.2	85.5	43.45
58.6	63.9	60.9	64.6	62.0	45.23	77.8	84.9	91.0	92.9	86.7	45.23
58.0	63.3	62.4	65.1	62.2	47.00	79.7	87.0	91.3	94.8	88.2	47.00

THIS IS THE INPUT DATA FOR THE FOURTIETH RUN GRAPHITE EXCHANGER
THIS RUN STARTED JANUARY 6, 1978
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 9.2
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME	BRINE	BRINE	BRINE	COOL H2O	COOL H2O	COOL H2O
HOURS	FLOWRATE	INLET	OUTLET	FLOW	INLET	OUTLET
.00	77.2	236.0	209.0	2684.	61.0	66.0
.85	77.2	243.0	214.0	3668.	63.0	68.5
1.78	77.2	243.5	215.0	4751.	65.0	71.0
3.15	77.2	243.0	214.5	6296.	64.0	70.0
8.18	77.2	245.0	212.0	12238.	57.0	63.0
19.50	77.2	244.0	215.0	25421.	57.5	64.0

RESULTS FROM THE FOURTIETH RUN GRAPHITE EXCHANGER
THIS RUN STARTED JANUARY 6, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 9.2
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

BRINE LB/HR	WATER LB/HR	BRINE BTU	WATER BTU	MEAN TEMP	U BTU/HR/FT ²	TIME HOURS
1870	9630	49100	48100	158.5	167.2	.00
1860	9650	52600	53000	162.1	177.6	.85
1860	9390	51700	56300	160.6	183.3	1.78
1860	9810	51700	58800	161.1	187.0	3.15
1860	9700	59800	58200	167.7	191.7	8.18
1860	9700	52600	63100	168.1	187.5	19.50

THIS IS THE INPUT DATA FOR THE FOURTY FIRST RUN

THIS RUN STARTED JANUARY 7, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 10.2
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

TIME HOURS	FLOWS					COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	EXCH 1 IN OUT		EXCH 2 IN OUT	EXCH 3 IN OUT				
.00	9.6	9.6	9.8	51.0	564846.	78.2	90.9	69.1	78.2	62.7	69.1	
.50	9.7	9.7	9.7	51.0	565307.	78.2	91.1	69.0	78.2	62.5	69.0	
1.00	9.7	9.6	9.7	51.0	565754.	79.0	91.8	69.9	79.0	63.4	69.9	
2.03	9.7	9.6	9.8	51.0	566715.	80.5	93.3	71.3	80.5	64.8	71.3	
5.20	9.7	9.7	9.7	51.0	569700.	81.9	94.5	72.8	81.9	66.3	72.8	
11.17	9.7	9.7	9.6	51.0	575400.	77.6	90.4	68.2	77.6	61.6	68.2	

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
279.0	215.0	279.0	214.0	279.0	216.0	278.4	216.0	215.0	173.0	214.0	172.0	216.0	171.0		
280.0	216.0	280.0	215.0	280.0	216.0	279.6	217.0	216.0	174.0	215.0	173.0	216.0	172.0		
280.0	216.0	280.0	215.0	280.0	217.0	279.3	217.0	216.0	174.0	215.0	173.0	217.0	171.8		
280.0	216.0	280.0	216.0	280.0	217.0	279.6	217.7	216.0	175.0	216.0	174.0	217.0	172.6		
279.0	217.0	279.0	217.0	279.0	217.0	278.6	217.6	217.0	176.0	217.0	175.0	217.0	173.1		
281.0	217.0	281.0	217.0	281.0	218.0	279.8	217.1	217.0	175.0	217.0	174.0	218.0	173.0		

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
173.0	141.0	172.0	141.0	171.0	142.0	170.8	144.8
174.0	142.0	173.0	142.0	172.0	143.0	172.0	145.9
174.0	142.0	173.0	142.0	172.0	142.0	171.8	145.6
175.0	143.0	174.0	143.0	173.0	144.0	172.6	146.7
176.0	144.0	175.0	144.0	174.0	145.0	173.1	147.1
175.0	143.0	174.0	143.0	173.0	144.0	171.7	145.0

RESULTS FROM THE FOURTY FIRST RUN

THIS RUN STARTED JANUARY 7, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
B. CALCIUM : NONE
C. SILICA : NONE
D. CARBONATE: NONE
E. PH : 10.2
F. ADDITIVE : NONE
1. LEVEL : NONE
G. OTHER :

COOL H2O LB/HR	FLOWRATES				TIME HOURS	MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS				AVERAGE	TIME HOURS
	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR		TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F		
7636.3	462.0	474.5	484.6	484.9	.00	180.0	188.4	185.1	183.8	184.3	.00
7404.1	464.3	479.2	481.8	484.6	.50	178.1	187.4	184.8	181.4	182.9	.50
7703.7	464.3	474.3	481.8	484.7	1.00	182.1	189.6	185.4	184.8	185.5	1.00
7802.7	464.3	474.3	484.4	484.6	2.03	185.3	189.3	189.6	186.2	187.6	2.03
7902.1	464.5	479.5	482.0	484.9	5.20	182.5	188.4	189.4	187.2	186.9	5.20
7826.4	464.1	479.0	476.4	484.6	11.17	180.9	186.7	182.1	185.5	183.8	11.17

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
		BTU/HR. SQ.FT.	DEG. F		HOURS			BTU/HR. SQ.FT.	DEG. F		HOURS
161.4	167.2	182.6	183.7	173.7	.00	165.2	165.2	157.6	139.1	156.8	.00
159.7	166.3	175.3	179.7	170.3	.50	162.5	163.3	153.3	136.3	153.9	.50
162.7	167.6	182.0	184.1	174.1	1.00	166.8	165.8	163.8	140.7	159.3	1.00
162.6	171.0	183.2	187.8	176.2	2.03	169.3	168.3	160.6	141.3	159.9	2.03
164.1	174.3	180.3	188.2	176.7	5.20	171.1	172.0	161.5	144.3	162.2	5.20
162.4	172.4	179.6	186.1	175.1	11.17	164.4	165.2	153.5	143.7	156.7	11.17

THIS IS THE INPUT DATA FOR THE FOURTY SECOND RUN GRAPHITE EXCHANGE
THIS RUN STARTED JANUARY 18, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 40,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 27 PPM
- C. SILICA : 375 PPM
- D. CARBONATE: 750 PPM
- E. PH : 7.0
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS WAS A SCALING RUN IN THE GRAPHITE EXCHANGERS

TIME	BRINE	BRINE	BRINE	COOL H2O	COOL H2O	COOL H2O
HOURS	FLOWRATE	INLET	OUTLET	FLOW	INLET	OUTLET
	GAGE	DEG F	DEG F	GALLONS	DEG F	DEG F
.00	65.0	248.0	207.0	35120.	39.0	45.0
.85	65.0	252.0	211.0	36150.	38.0	45.0
1.78	64.0	249.0	210.0	37296.	38.0	45.0
3.27	71.0	249.0	209.0	39077.	38.0	45.0
5.33	70.0	244.0	205.0	41622.	37.0	44.0
6.47	70.0	244.0	205.0	43001.	38.0	44.5
10.73	70.0	242.0	203.0	48141.	32.5	44.0
22.62	79.0	233.0	197.0	62477.	35.0	41.0

RESULTS FROM THE FOURTY SECOND RUN GRAPHITE EXCHANGE

THIS RUN STARTED JANUARY 18, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 40,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 27 PPM
- C. SILICA : 375 PPM
- D. CARBONATE: 750 PPM
- E. PH : 7.0
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS WAS A SCALING RUN IN THE GRAPHITE EXCHANGERS

BRINE	WATER	BRINE	WATER	MEAN	U	TIME
LB/HR	LB/HR	BTU	BTU	TEMP	BTU/HREFT2	HOURS
1560	10120	62500	60900	184.5	182.3	.00
1560	10260	62400	72000	189.0	193.8	.85
1540	10030	58500	70400	187.1	187.8	1.78
1710	10290	66600	72200	186.5	202.9	3.27
1690	10170	64100	71400	183.0	201.8	5.33
1690	10060	64100	65600	182.3	193.9	6.47
1690	10080	64200	116300	183.1	268.6	10.73
1910	10110	67100	60800	176.2	197.9	22.62

THIS IS THE INPUT DATA FOR THE FOURTY THIRD RUN

THIS RUN STARTED JANUARY 24, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 34,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 24 PPM
- C. SILICA : 360 PPM
- D. CARBONATE: 720 PPM
- E. PH : 6.5
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

FLOWS						COOLING WATER TEMPERATURES IN DEG. F					
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1	EXCH 2	EXCH 3	EXCH 4	EXCH 5	EXCH 6
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	9.5	9.5	9.7	50.0	576314.	69.1	88.2	55.6	69.1	46.6	55.6
.55	9.4	9.4	9.9	50.5	576672.	69.2	88.8	55.7	69.2	46.4	55.7
1.18	9.5	9.5	9.6	50.0	577101.	69.5	88.7	56.0	69.5	46.8	56.0
2.67	10.0	10.0	10.0	50.0	578077.	71.5	89.0	58.3	71.5	49.2	58.3
3.97	10.0	10.0	10.0	52.0	578971.	72.1	88.5	59.0	72.1	49.7	59.0
5.40	10.0	10.0	10.0	51.0	579944.	70.4	85.3	58.5	70.4	49.8	58.5
6.60	10.0	10.0	10.0	50.5	580756.	70.2	84.4	59.1	70.2	50.9	59.1

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
283.0	214.0	283.0	216.0	283.0	215.0	282.0	212.5
285.0	214.0	285.0	218.0	285.0	216.0	285.1	214.5
283.0	214.0	283.0	217.0	284.0	215.0	283.0	213.1
281.0	215.0	281.0	219.0	281.0	217.0	280.4	214.7
279.0	219.0	279.0	223.0	279.0	221.0	278.4	220.7
278.0	223.0	278.0	226.0	278.0	225.0	277.8	223.9
275.0	224.0	275.0	227.0	276.0	226.0	275.0	224.5

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
214.0	167.0	216.0	167.0	215.0	167.0	212.5	164.2
214.0	167.0	218.0	167.0	216.0	169.0	214.5	166.5
214.0	167.0	217.0	168.0	215.0	167.0	213.1	165.5
215.0	169.0	219.0	169.0	217.0	169.0	214.7	168.1
219.0	174.0	223.0	176.0	221.0	175.0	220.7	174.8
224.0	182.0	226.0	184.0	225.0	182.0	223.9	181.6
224.0	187.0	227.0	189.0	226.0	187.0	224.5	185.5

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
167.0	132.0	167.0	134.0	167.0	135.0	164.2	135.8
167.0	132.0	167.0	134.0	169.0	136.0	166.5	137.8
167.0	133.0	168.0	135.0	167.0	135.0	165.5	136.9
169.0	134.0	169.0	137.0	169.0	137.0	168.1	139.6
174.0	139.0	176.0	142.0	175.0	144.0	174.8	146.2
182.0	146.0	184.0	151.0	182.0	153.0	181.6	154.9
187.0	154.0	189.0	158.0	187.0	159.0	185.5	160.6

RESULTS FROM THE FOURTY THIRD RUN

THIS RUN STARTED JANUARY 24, 1979

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 34,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 24 PPM
 C. SILICA : 360 PPM
 D. CARBONATE: 720 PPM
 E. PH : 6.5
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER :

MINI EXCHANGER NUMBER 1									
OVERALL HEAT TRANSFER COEFFICIENTS									
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.
5394.0	453.6	468.7	481.1	474.6	.00	183.2	182.5	190.8	194.6
5615.5	448.2	463.3	490.9	478.6	.55	190.0	182.8	200.9	201.4
5576.1	453.6	468.7	475.7	474.4	1.18	187.1	183.0	195.0	198.8
5553.4	479.1	493.8	497.0	475.0	2.67	184.2	175.9	184.0	182.3
5626.4	479.6	494.3	497.5	494.4	3.97	169.4	160.8	168.7	167.2
5610.7	479.8	494.5	497.7	485.1	5.40	150.3	145.1	149.3	148.5
5581.5	480.5	495.2	498.2	480.9	6.60	140.8	135.3	141.8	139.3

MINI EXCHANGER NUMBER 2									
OVERALL HEAT TRANSFER COEFFICIENTS									
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4
BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.
164.4	176.0	177.5	180.1	174.5	.00	158.9	153.0	151.4	133.6
165.2	182.9	178.2	180.4	176.7	.55	161.5	155.6	161.5	137.1
168.0	178.4	179.4	179.8	176.4	1.18	158.6	156.5	154.8	137.3
169.8	187.7	182.6	171.4	177.9	2.67	169.9	157.3	158.3	133.2
163.4	172.1	171.4	170.3	169.3	3.97	163.8	159.7	145.6	132.0
140.4	145.6	151.7	146.2	146.0	5.40	153.9	140.6	124.1	110.5
125.3	130.3	136.1	132.8	131.1	6.60	134.0	126.3	115.1	98.7

MINI EXCHANGER NUMBER 3									
OVERALL HEAT TRANSFER COEFFICIENTS									
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4
BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.	HOURS	BTU/HR.	BTU/HR.	BTU/HR.	BTU/HR.
158.9	153.0	151.4	133.6	149.3	.00	161.5	155.6	161.5	137.1
161.5	155.6	161.5	137.1	153.9	.55	158.6	156.5	154.8	137.3
169.9	157.3	158.3	133.2	154.7	2.67	163.8	159.7	145.6	132.0
153.9	140.6	124.1	110.5	132.3	3.97	134.0	126.3	115.1	98.7

THIS IS THE INPUT DATA FOR THE FOURTY FOURTH RUN

THIS RUN STARTED JANUARY 25, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 34,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 24 PPM
 C. SILICA : 350 PPM
 D. CARBONATE: 700 PPM
 E. PH : 6.0
 F. ADDITIVE : NONE
 1. LEVEL : NONE
 G. OTHER :

FLOWS					COOLING WATER TEMPERATURES IN DEG. F											
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3		EXCH 3				
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT	IN	OUT			
.00	9.6	9.7	9.8	9.8	601224.	67.0	85.6	53.8	67.0	44.5	53.8	67.0	53.8			
.58	9.8	9.7	9.8	9.8	601636.	69.4	88.5	55.8	69.4	46.2	55.8	69.4	55.8			
1.16	9.7	9.7	9.8	9.8	602038.	70.2	89.3	56.5	70.2	47.0	56.5	70.2	56.5			
2.42	9.7	9.8	10.0	9.8	602904.	72.0	90.4	58.6	72.0	49.2	58.6	72.0	58.6			
3.40	10.0	10.0	10.0	10.0	603583.	73.7	92.6	60.3	73.7	50.8	60.3	73.7	60.3			
4.00	9.9	9.6	9.9	9.9	604540.	73.7	90.9	60.5	73.7	51.0	60.5	73.7	60.5			
6.03	9.8	9.6	9.8	9.8	605394.	72.6	90.0	59.5	72.6	50.1	59.5	72.6	59.5			
9.33	10.0	10.0	10.0	10.0	607720.	67.0	84.0	53.2	67.0	43.8	53.2	67.0	53.2			
10.53	9.5	9.3	9.1	9.1	608570.	64.5	80.0	52.3	64.5	43.8	52.3	64.5	52.3			
21.93	9.5	9.4	9.3	9.3	616793.	66.2	80.1	54.8	66.2	46.3	54.8	66.2	54.8			

EXCHANGER NUMBER 1 TEMPS IN DEG. F

IN	OUT	IN	OUT	IN	OUT	IN	OUT
273.0	207.0	273.0	209.0	273.0	205.0	273.1	207.8
277.0	211.0	277.0	212.0	278.0	209.0	277.0	211.3
275.0	210.0	275.0	211.0	275.0	209.0	276.2	211.4
275.0	211.0	275.0	211.0	275.0	210.0	275.0	211.8
276.0	213.0	276.0	211.0	276.0	212.0	275.7	213.1
275.0	216.0	275.0	217.0	275.0	214.0	274.5	215.3
275.0	216.0	275.0	216.0	275.0	214.0	274.2	214.5
274.0	217.0	274.0	215.0	274.0	214.0	273.7	217.7
273.0	219.0	273.0	220.0	274.0	215.0	272.9	221.1
269.0	222.0	269.0	222.0	269.0	219.0	268.4	218.9

EXCHANGER NUMBER 2 TEMPS IN DEG. F

IN	OUT	IN	OUT	IN	OUT	IN	OUT
207.0	164.0	209.0	163.0	205.0	164.0	207.8	161.8
211.0	167.0	212.0	165.0	209.0	167.0	211.3	164.9
210.0	167.0	211.0	164.0	209.0	167.0	211.4	165.7
211.0	169.0	211.0	166.0	210.0	168.0	211.8	167.0
213.0	170.0	211.0	167.0	212.0	170.0	213.1	168.8
216.0	173.0	217.0	173.0	214.0	173.0	215.3	170.9
216.0	172.0	216.0	172.0	214.0	172.0	214.5	170.3
217.0	171.0	215.0	169.0	214.0	170.0	217.7	172.5
219.0	179.0	220.0	178.0	215.0	176.0	221.1	180.0
222.0	184.0	222.0	184.0	219.0	182.0	218.9	178.9

EXCHANGER NUMBER 3 TEMPS IN DEG. F

IN	OUT	IN	OUT	IN	OUT	IN	OUT
164.0	129.0	163.0	132.0	164.0	133.0	161.8	133.9
167.0	132.0	165.0	133.0	167.0	135.0	164.9	136.5
167.0	133.0	164.0	133.0	167.0	136.0	165.7	137.2
169.0	134.0	166.0	135.0	168.0	138.0	167.0	138.9
170.0	136.0	167.0	136.0	170.0	139.0	168.8	140.5
173.0	139.0	173.0	142.0	173.0	142.0	170.9	142.4
172.0	138.0	172.0	140.0	172.0	141.0	170.3	141.9
171.0	136.0	169.0	137.0	170.0	140.0	172.5	143.4
179.0	146.0	178.0	147.0	176.0	148.0	180.0	154.0
184.0	152.0	184.0	154.0	182.0	154.0	178.9	152.9

RESULTS FROM THE FOURTY FOURTH RUN

THIS RUN STARTED JANUARY 25, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 34,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 24 PPM
- C. SILICA : 350 PPM
- D. CARBONATE: 700 PPM
- E. PH : 6.0
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER :

FLOWRATES

COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS
5889.6	460.8	480.8	488.6	495.7	.00
5743.3	470.0	479.9	487.4	504.3	.58
5694.3	465.4	480.4	488.1	504.5	1.16
5756.0	465.4	485.3	498.4	504.7	2.42
5647.8	480.3	495.0	498.2	514.1	3.40
5750.5	475.5	485.3	493.3	495.3	4.80
5833.6	470.4	485.3	488.1	475.4	6.03
5889.5	480.7	495.5	498.7	524.1	9.33
5987.2	455.7	461.0	452.2	514.8	10.53
5892.7	456.6	466.8	463.6	477.7	21.93

MINI EXCHANGER NUMBER 1
OVERALL HEAT TRANSFER COEFFICIENTS

TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
190.9	191.7	210.0	202.5	198.8	.00
191.7	192.1	208.9	204.6	199.3	.58
191.0	193.4	204.1	204.7	198.3	1.16
187.2	195.3	204.4	199.9	196.7	2.42
190.5	204.1	201.5	202.7	199.7	3.40
175.1	175.1	189.2	183.8	180.8	4.80
174.2	179.7	188.2	187.0	182.3	6.03
164.6	176.8	181.5	176.0	174.7	9.33
147.6	146.0	161.7	158.9	153.5	10.53
129.4	132.3	141.2	144.3	136.8	21.93

MINI EXCHANGER NUMBER 2
OVERALL HEAT TRANSFER COEFFICIENTS

TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
166.0	184.9	169.0	192.5	178.1	.00
169.7	186.2	169.1	193.7	179.7	.58
166.6	170.0	171.3	192.2	180.0	1.16
163.4	185.2	176.5	190.4	178.9	2.42
170.4	183.6	173.2	188.9	179.0	3.40
166.9	173.8	166.3	181.8	172.2	4.80
168.5	173.8	168.0	180.5	172.7	6.03
171.4	179.4	172.5	182.0	176.3	9.33
138.1	146.8	137.0	150.6	145.1	10.53
128.5	131.4	129.3	145.9	133.8	21.93

MINI EXCHANGER NUMBER 3
OVERALL HEAT TRANSFER COEFFICIENTS

TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
173.2	157.9	158.8	145.7	158.9	.00
172.7	161.7	160.9	147.8	160.8	.58
166.9	159.2	156.8	148.8	157.9	1.16
172.8	160.8	155.5	147.4	159.1	2.42
171.0	162.9	158.8	149.1	160.4	3.40
167.2	152.9	155.4	144.5	155.0	4.80
165.6	159.0	154.0	143.5	155.5	6.03
164.3	155.2	143.5	142.2	151.3	9.33
137.0	130.0	115.5	116.9	124.8	10.53
130.1	123.5	115.4	112.3	120.3	21.93

THIS IS THE INPUT DATA FOR THE FOURTY FIFTH RUN

THIS RUN STARTED JANUARY 30, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : NONE

C. SILICA : NONE

D. CARBONATE: NONE

E. PH : 10.2

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD THE KENICS MIXER IN TUBE 4 OF THE FIRST EXCHANGER

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1		EXCH 2		EXCH 3	
.00	5.9	5.8	6.0	32.0	619092.	IN	OUT	IN	OUT	IN	OUT
.52	5.8	5.7	6.0	32.0	619443.	60.9	77.9	52.4	60.9	47.1	52.4
1.03	5.8	5.7	6.0	31.5	619788.	60.9	78.4	52.3	60.9	47.0	52.3
2.85	5.8	5.7	6.0	32.0	621017.	60.7	77.9	52.1	60.7	46.9	52.1
7.75	5.7	5.6	6.0	31.5	624400.	59.7	76.7	51.3	59.7	46.2	51.3
8.35	5.7	5.6	6.1	31.5	624810.	58.8	76.2	50.3	58.8	45.0	50.3
18.90	5.9	5.8	5.8	32.0	632160.	58.8	76.2	50.2	58.8	44.9	50.2
						57.4	75.0	48.6	57.4	43.2	48.6

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
282.0	192.0	282.0	198.0	282.0	188.0	280.2	155.8	192.0	148.0	198.0	145.0	188.0	149.0	155.8	119.1
283.0	193.0	283.0	200.0	283.0	189.0	281.5	156.5	193.0	146.0	200.0	146.0	189.0	149.0	156.5	119.7
283.0	192.0	283.0	199.0	283.0	189.0	281.6	156.1	192.0	148.0	199.0	146.0	189.0	150.0	156.1	119.4
282.0	191.0	282.0	199.0	282.0	189.0	280.4	155.3	191.0	147.0	199.0	145.0	189.0	149.0	155.3	118.8
284.0	192.0	283.0	199.0	283.0	190.0	282.1	156.3	192.0	147.0	199.0	145.0	190.0	150.0	156.3	119.1
283.0	192.0	283.0	199.0	283.0	191.0	281.3	156.2	192.0	147.0	199.0	145.0	191.0	150.0	156.2	119.3
289.0	195.0	289.0	202.0	289.0	191.0	286.6	158.3	195.0	149.0	202.0	147.0	191.0	149.0	158.3	120.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
148.0	113.0	145.0	113.0	149.0	115.0	119.1	101.4
146.0	113.0	146.0	113.0	149.0	116.0	119.7	101.6
148.0	113.0	146.0	113.0	150.0	116.0	119.4	101.3
147.0	113.0	145.0	113.0	149.0	115.0	118.8	100.6
147.0	112.0	145.0	112.0	150.0	116.0	119.1	100.7
147.0	112.0	145.0	112.0	150.0	116.0	119.3	100.7
149.0	113.0	147.0	113.0	149.0	114.0	120.0	100.8

RESULTS FROM THE FOURTY FIFTH RUN

THIS RUN STARTED JANUARY 30, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : NONE

C. SILICA : NONE

D. CARBONATE: NONE

E. PH : 10.2

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD THE KENICS MIXER IN TUBE 4 OF THE FIRST EXCHANGER

FLOURATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
5637.6	273.1	286.0	290.9	304.0	.00	150.8	144.2	170.4	274.2	184.9	.00
5551.4	268.0	280.9	290.8	303.8	.52	148.9	140.3	171.4	277.1	184.4	.52
5616.6	268.0	280.9	290.8	299.1	1.03	150.3	141.7	170.5	272.6	183.8	1.03
5734.4	268.1	281.0	290.9	304.0	2.85	150.9	140.1	168.7	277.0	184.2	2.85
5676.2	262.8	275.9	290.8	299.0	7.75	149.1	139.7	168.4	272.6	182.4	7.75
5787.1	262.9	275.9	295.9	299.1	8.35	149.4	141.1	170.7	274.7	184.0	8.35
5744.8	272.2	285.0	279.7	303.1	18.90	151.7	143.5	164.9	270.8	182.7	18.90

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS				
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4
					HOURS				
114.0	142.8	108.7	149.5	128.7	.00	122.0	118.7	123.7	90.7
118.9	139.6	109.8	146.9	128.8	.52	114.3	119.8	119.4	92.3
112.8	140.2	108.6	147.6	127.3	1.03	118.0	117.9	120.4	89.8
112.0	141.3	110.2	147.5	127.7	2.85	115.0	114.6	121.7	92.2
111.2	138.0	108.5	145.4	125.8	7.75	116.6	116.6	119.9	90.8
112.5	139.5	114.0	145.7	127.9	8.35	117.2	117.2	122.5	92.1
114.1	140.7	108.6	146.9	127.6	18.90	118.8	118.7	117.9	92.2

THIS IS THE INFLU DATA FOR THE FOURTY SIXTH RUN

THIS RUN STARTED JANUARY 31, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 23 PPM

C. SILICA : 430 PPM

D. CARBONATE: 860 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD THE KENICS MIXER IN TUBE 4 OF THE FIRST EXCHANGER

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.1	6.0	6.2	32.5	633225.	59.2	77.0	50.1	59.2	44.4	50.1
.52	6.1	6.2	6.5	33.0	633578.	59.8	76.2	50.4	59.8	44.5	50.4
1.07	6.3	6.3	6.5	33.0	633955.	60.1	75.1	50.6	60.1	44.2	50.6
1.92	6.5	6.5	6.6	33.0	634507.	61.2	75.8	51.5	61.2	44.0	51.5
8.27	6.6	6.8	6.8	33.0	638880.	53.3	63.0	48.2	53.3	43.7	48.2

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
287.0	196.0	287.0	201.0	287.0	193.0	284.5	163.9	196.0	150.0	201.0	148.0	193.0	152.0	163.9	124.3
286.0	203.0	286.0	206.0	286.0	201.0	284.3	170.3	203.0	154.0	206.0	153.0	201.0	157.0	170.3	128.1
287.0	211.0	287.0	214.0	287.0	209.0	285.3	174.2	211.0	160.0	214.0	161.0	209.0	165.0	174.2	130.9
288.0	220.0	288.0	222.0	288.0	220.0	286.2	181.3	220.0	168.0	222.0	162.0	220.0	167.0	181.3	137.0
287.0	242.0	287.0	245.0	287.0	245.0	285.0	202.4	242.0	211.0	245.0	215.0	245.0	217.0	202.4	177.5

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
150.0	114.0	148.0	114.0	152.0	117.0	124.3	104.1
154.0	116.0	153.0	117.0	157.0	121.0	128.1	106.9
160.0	120.0	161.0	123.0	165.0	125.0	130.9	108.4
168.0	125.0	162.0	129.0	167.0	133.0	137.0	112.4
211.0	182.0	215.0	187.0	217.0	191.0	177.5	145.5

RESULTS FROM THE FOURTY SIXTH RUN

THIS RUN STARTED JANUARY 31, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 23 PPM

C. SILICA : 430 PPM

D. CARBONATE: 860 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD THE KENICS MIXER IN TUBE 4 OF THE FIRST EXCHANGER

FLOURATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
5670.8	282.5	295.2	300.5	308.1	.00	154.4	149.8	171.5	256.8	183.1	.00
5693.8	282.6	305.2	316.1	312.9	.52	136.0	140.1	156.8	236.2	167.3	.52
5395.6	292.5	310.0	315.9	312.8	1.07	120.0	120.9	133.9	216.0	147.7	1.07
5720.9	302.4	319.7	320.9	312.6	1.92	113.7	116.0	120.7	208.7	139.8	1.92
5697.1	307.5	334.6	331.3	312.8	8.27	66.3	66.8	66.2	139.1	84.6	8.27

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS						OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
					HOURS						HOURS
118.4	141.5	112.4	147.9	130.1	.00	123.2	122.9	123.6	94.6	116.1	.00
119.1	138.3	118.7	149.6	131.4	.52	124.1	126.7	125.3	94.8	117.7	.52
117.4	127.5	107.7	143.3	124.0	1.07	124.6	122.5	127.5	95.2	117.5	1.07
115.2	143.4	125.1	136.2	130.0	1.92	146.1	118.8	117.4	109.9	123.1	1.92
52.6	54.3	49.8	54.0	52.7	8.27	58.8	59.9	54.1	29.5	50.6	8.27

THIS IS THE INPUT DATA FOR THE FOURTY SEVENTH RUN
THIS RUN STARTED FEBRUARY 1, 1978
THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : NONE
- D. CARBONATE: NONE
- E. PH : 10
- F. ADDITIVE : NONE
- I. LEVEL : NONE
- G. OTHER : THIS RUN WAS MADE WITH ALUMINUM TUBE IN THE EXCHANGERS

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.0	6.1	6.1	32.0	645690.	61.7	77.8	52.6	61.7	47.1	52.6
.48	6.0	6.0	6.2	33.0	646040.	61.2	77.6	52.0	61.2	46.5	52.0
4.18	6.0	6.0	6.1	33.0	648682.	61.6	77.1	51.2	61.6	45.0	51.2
16.13	6.1	6.0	6.1	32.5	657397.	59.8	73.3	49.7	59.8	43.7	49.7
17.88	6.1	5.9	6.2	33.0	658709.	59.9	73.2	50.1	59.9	44.2	50.1
20.22	6.1	6.1	6.0	32.0	660459.	61.7	74.9	51.9	61.7	46.0	51.9

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
288.0	190.0	288.0	198.0	288.0	192.0	285.5	190.1	190.0	144.0	198.0	141.0	192.0	143.0	190.1	137.2
292.0	191.0	292.0	200.0	292.0	195.0	290.7	193.8	191.0	144.0	200.0	142.0	195.0	145.0	193.8	139.2
295.0	206.0	295.0	209.0	295.0	206.0	293.1	203.1	206.0	154.0	209.0	152.0	206.0	152.0	203.1	142.9
288.0	206.0	288.0	209.0	288.0	205.0	285.4	202.6	208.0	155.0	209.0	152.0	205.0	151.0	202.6	141.5
289.0	208.0	289.0	209.0	289.0	206.0	286.4	203.4	208.0	155.0	209.0	152.0	206.0	151.0	203.4	142.4
287.0	208.0	287.0	210.0	287.0	206.0	283.9	202.6	208.0	155.0	210.0	153.0	206.0	151.0	202.6	141.2

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
144.0	110.0	141.0	111.0	143.0	113.0	137.2	115.0
144.0	110.0	142.0	111.0	145.0	114.0	137.2	116.5
154.0	115.0	152.0	115.0	152.0	118.0	142.9	120.2
155.0	115.0	152.0	115.0	151.0	117.0	141.5	119.2
155.0	115.0	152.0	115.0	151.0	117.0	142.4	119.7
155.0	116.0	153.0	116.0	151.0	118.0	141.2	119.9

RESULTS FROM THE FOURTY SEVENTH RUN

THIS RUN STARTED FEBRUARY 1, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 30,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : NONE
- C. SILICA : NONE
- D. CARBONATE: NONE
- E. PH : 10
- F. ADDITIVE : NONE
- I. LEVEL : NONE
- G. OTHER : THIS RUN WAS MADE WITH ALUMINUM TUBE IN THE EXCHANGERS

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS
6017.4	277.3	299.9	295.2	303.2	.00	168.3	162.3	174.2	180.1	171.2	.00
5929.8	276.8	294.5	299.8	312.0	.48	168.7	158.2	172.9	181.1	170.2	.48
6058.4	276.4	294.0	294.3	311.6	4.18	143.5	146.0	152.7	165.9	152.0	4.18
6231.2	282.3	295.0	295.2	308.0	16.13	129.0	132.7	141.3	149.2	138.0	16.13
6216.0	282.2	289.9	300.2	312.6	17.88	128.5	130.0	141.0	149.0	137.1	17.88
6068.9	282.5	300.1	290.2	303.5	20.22	127.5	131.2	135.2	144.6	134.6	20.22

MINI EXCHANGER NUMBER 2					MINI EXCHANGER NUMBER 3						
OVERALL HEAT TRANSFER COEFFICIENTS					OVERALL HEAT TRANSFER COEFFICIENTS						
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
		BTU/HR. SQ.FT.	DEG. F.		HOURS			BTU/HR. SQ.FT.	DEG. F.		HOURS
121.5	160.6	137.5	158.7	144.6	.00	132.4	127.5	122.2	94.6	119.2	.00
120.9	155.1	136.4	160.8	143.3	.48	128.5	125.0	122.4	94.6	117.6	.48
125.1	145.8	139.7	174.6	146.3	4.18	135.2	137.8	124.1	90.6	121.9	4.18
126.1	143.3	138.4	173.1	145.2	16.13	137.5	134.9	123.0	87.1	120.6	16.13
123.8	138.4	140.3	170.9	143.4	17.88	136.5	131.7	124.2	88.6	120.3	17.88
124.7	142.9	136.6	169.9	143.6	20.22	135.6	138.0	118.6	83.2	118.9	20.22

THIS IS THE INPUT DATA FOR THE FOURTY EIGHTH RUN
 THIS RUN STARTED FEBRUARY 6, 1978
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 21 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 6.9
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER : THIS RUN WAS MADE WITH ALUMINUM TUBES IN THE EXCHANGERS

TIME HOURS	FLOWS				COOL H2O GALLONS	COOLING WATER TEMPERATURES IN DEG. F							
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE		EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.1	6.1	6.2	33.0	662931.	70.7	84.0	60.1	70.7	53.6	60.1		
.50	6.1	6.1	6.3	33.0	663309.	71.7	85.0	60.6	71.7	53.8	60.6		
1.02	6.3	6.2	6.2	33.0	663690.	70.9	83.5	60.2	70.9	53.5	60.2		
2.22	6.3	6.3	6.4	33.0	664607.	69.6	81.4	59.2	69.6	52.3	59.2		
3.08	6.4	6.3	6.5	33.0	665270.	70.6	82.2	60.5	70.6	53.1	60.5		
4.00	6.4	6.4	6.6	34.0	665980.	67.9	78.8	58.2	67.9	51.0	58.2		
9.92	6.6	6.6	6.6	34.0	670420.	62.3	71.0	54.8	62.3	48.1	54.8		

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
313.0	231.0	313.0	231.0	313.0	231.0	310.3	226.9	231.0	173.0	231.0	167.0	231.0	169.0	226.9	157.3
313.0	234.0	313.0	233.0	313.0	236.0	311.0	230.8	234.0	175.0	233.0	172.0	236.0	172.0	230.8	161.6
313.0	237.0	313.0	235.0	313.0	238.0	311.8	232.4	237.0	177.0	235.0	174.0	238.0	174.0	232.4	162.5
313.0	240.0	313.0	237.0	313.0	242.0	310.5	237.5	240.0	180.0	237.0	176.0	242.0	180.0	237.5	170.7
314.0	244.0	314.0	241.0	314.0	246.0	311.8	242.8	244.0	186.0	241.0	182.0	246.0	189.0	242.8	178.4
314.0	246.0	314.0	243.0	314.0	247.0	311.6	245.0	246.0	188.0	243.0	184.0	247.0	191.0	245.0	182.5
314.0	257.0	314.0	257.0	314.0	261.0	311.9	260.1	257.0	211.0	257.0	209.0	261.0	220.0	260.1	210.9

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
173.0	129.0	167.0	126.0	169.0	132.0	157.3	134.4
175.0	131.0	172.0	129.0	172.0	135.0	161.6	137.1
177.0	132.0	174.0	130.0	174.0	135.0	162.5	137.0
180.0	134.0	176.0	132.0	180.0	140.0	170.7	140.4
186.0	138.0	182.0	136.0	189.0	146.0	178.4	145.9
188.0	140.0	184.0	138.0	191.0	148.0	182.5	148.3
211.0	165.0	209.0	161.0	220.0	181.0	210.9	179.6

RESULTS FROM THE FOURTY EIGHTH RUN
 THIS RUN STARTED FEBRUARY 6, 1978
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 21 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 6.9
 F. ADDITIVE : NONE
 I. LEVEL : NONE
 G. OTHER : THIS RUN WAS MADE WITH ALUMINUM TUBES IN THE EXCHANGERS

MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS											
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
6270.1	279.0	296.4	296.8	309.0	.00	120.5	128.0	128.2	138.2	128.7	.00
6110.8	279.0	296.4	301.9	308.9	.50	116.2	125.4	121.9	132.5	124.0	.50
6338.5	288.9	301.3	296.8	308.8	1.02	114.0	122.7	115.2	129.4	120.3	1.02
6352.9	288.9	306.1	307.0	309.0	2.22	106.3	118.3	109.3	115.2	112.3	2.22
6423.9	293.7	306.0	311.9	308.8	3.08	104.3	114.2	107.0	108.9	108.6	3.08
6229.9	293.7	310.9	316.9	318.2	4.00	95.5	106.4	101.3	102.1	101.3	4.00
6279.4	303.6	320.6	316.9	318.2	9.92	77.4	81.7	74.4	73.5	76.8	9.92

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS											
TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
122.7	147.8	142.1	178.0	147.7	.00	140.6	146.0	125.6	84.4	124.2	.00
124.4	138.9	147.1	173.6	146.0	.50	137.4	146.5	123.6	86.8	123.6	.50
127.2	137.5	140.8	171.6	144.3	1.02	141.2	147.8	125.1	88.6	125.7	1.02
122.4	135.2	133.6	152.7	136.0	2.22	137.4	143.5	122.5	97.1	125.1	2.22
118.1	128.3	121.1	142.7	127.6	3.08	141.5	145.3	127.2	99.4	128.3	3.08
110.6	122.0	113.6	132.3	119.6	4.00	130.5	136.0	119.6	98.5	121.2	4.00
78.3	86.8	70.2	87.1	80.6	9.92	100.9	113.9	81.6	68.0	91.1	9.92

MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS											
TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS
122.7	147.8	142.1	178.0	147.7	.00	140.6	146.0	125.6	84.4	124.2	.00
124.4	138.9	147.1	173.6	146.0	.50	137.4	146.5	123.6	86.8	123.6	.50
127.2	137.5	140.8	171.6	144.3	1.02	141.2	147.8	125.1	88.6	125.7	1.02
122.4	135.2	133.6	152.7	136.0	2.22	137.4	143.5	122.5	97.1	125.1	2.22
118.1	128.3	121.1	142.7	127.6	3.08	141.5	145.3	127.2	99.4	128.3	3.08
110.6	122.0	113.6	132.3	119.6	4.00	130.5	136.0	119.6	98.5	121.2	4.00
78.3	86.8	70.2	87.1	80.6	9.92	100.9	113.9	81.6	68.0	91.1	9.92

THIS IS THE INPUT DATA FOR THE FOURTY NINTH RUN 1ST PART

THIS RUN STARTED FEBRUARY 9, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 21 PPM

C. SILICA : 425 PPM

D. CARBONATE: 850 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A ONE WEEK SHUTDOWN BETWEEN PARTS

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.3	6.4	6.3	33.0	0.	56.5	72.5	47.8	56.5	42.7	47.8
.48	6.4	6.5	6.4	33.0	506.	57.1	73.2	48.3	57.1	43.1	48.3
1.00	6.4	6.5	6.5	33.0	1053.	56.0	70.5	48.1	56.0	43.6	48.1
1.48	6.4	6.5	6.5	33.0	1559.	55.4	69.5	47.7	55.4	43.2	47.7
1.98	6.5	6.5	6.5	33.0	2088.	55.3	68.9	47.4	55.3	42.8	47.4
3.25	6.6	6.6	6.7	33.5	3420.	55.8	69.2	47.6	55.8	42.9	47.6
4.08	6.7	6.7	6.7	33.0	4289.	56.1	69.5	47.6	56.1	42.7	47.6
4.97	6.8	6.8	6.8	33.0	5213.	57.0	69.6	48.2	57.0	43.3	48.2
5.75	7.0	7.0	6.9	33.0	6029.	57.6	69.4	48.6	57.6	43.4	48.6
11.77	7.3	7.1	6.9	33.0	12359.	55.3	63.2	49.0	55.3	43.1	49.0

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
303.0	195.0	303.0	200.0	303.0	193.0	300.3	196.5	195.0	143.0	200.0	144.0	193.0	144.0	196.5	144.0
306.0	186.0	306.0	202.0	306.0	194.0	303.7	198.0	196.0	145.0	202.0	145.0	194.0	145.0	198.0	145.0
308.0	195.0	308.0	202.0	308.0	192.0	305.3	196.2	195.0	144.0	202.0	144.0	192.0	144.0	196.2	144.0
302.0	193.0	302.0	199.0	302.0	191.0	299.7	194.5	193.0	143.0	199.0	142.0	191.0	143.0	194.5	143.0
305.0	198.0	305.0	202.0	305.0	198.0	301.7	199.2	198.0	145.0	202.0	145.0	198.0	146.0	199.2	145.0
306.0	201.0	306.0	202.0	306.0	204.0	302.8	202.7	201.0	147.0	202.0	145.0	204.0	148.0	202.7	147.0
307.0	205.0	307.0	206.0	307.0	209.0	305.3	206.9	205.0	149.0	206.0	147.0	209.0	151.0	206.9	149.0
307.0	210.0	307.0	209.0	307.0	214.0	304.1	211.4	210.0	151.0	209.0	149.0	214.0	154.0	211.4	151.0
305.0	215.0	305.0	216.0	305.0	220.0	301.9	215.8	215.0	154.0	216.0	153.0	220.0	158.0	215.8	154.0
297.0	234.0	297.0	238.0	298.0	236.0	294.1	235.4	234.0	188.0	238.0	190.0	236.0	194.0	235.4	192.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
143.0	108.0	144.0	109.0	144.0	112.0	144.0	113.6
145.0	109.0	145.0	110.0	145.0	113.0	145.0	114.0
144.0	108.0	144.0	109.0	144.0	111.0	144.0	112.2
143.0	107.0	142.0	108.0	143.0	110.0	143.0	111.3
145.0	108.0	145.0	110.0	146.0	112.0	145.0	112.5
147.0	108.0	145.0	110.0	148.0	114.0	147.0	113.9
149.0	110.0	147.0	111.0	151.0	115.0	149.0	115.0
151.0	111.0	149.0	113.0	154.0	116.0	151.0	116.4
154.0	114.0	153.0	115.0	158.0	120.0	154.0	118.2
188.0	138.0	190.0	144.0	194.0	153.0	192.0	148.2

RESULTS FROM THE FOURTY NINTH RUN 1ST PART

THIS RUN STARTED FEBRUARY 9, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 21 PPM

C. SILICA : 425 PPM

D. CARBONATE: 850 PPM

E. PH : 6.8

F. ADDITIVE : NONE

1. LEVEL : NONE

G. OTHER : THIS RUN HAD A ONE WEEK SHUTDOWN BETWEEN PARTS

FLOURATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT.	TUBE2 BTU/HR. SQ.FT.	TUBE3 BTU/HR. SQ.FT.	TUBE4 BTU/HR. SQ.FT.	AVERAGE	TIME HOURS
8708.4	290.3	312.5	303.3	310.5	.00	198.5	200.3	212.8	204.2	204.0	.00
8793.9	294.8	316.9	308.0	310.0	.48	202.9	202.1	217.3	204.6	206.7	.48
8712.1	294.5	316.6	312.8	309.8	1.00	191.0	188.2	210.4	194.3	196.0	1.00
8800.2	295.4	317.5	313.7	310.6	1.48	189.1	188.2	205.9	191.8	193.7	1.48
8745.5	299.9	317.1	313.2	310.3	1.98	181.4	182.2	189.4	180.3	183.3	1.98
8677.7	304.7	321.8	323.2	314.9	3.25	177.2	184.7	180.8	174.7	179.4	3.25
8694.1	309.6	326.6	323.1	309.8	4.08	174.7	182.0	173.0	168.3	174.5	4.08
8668.1	314.5	331.4	328.2	310.0	4.97	164.3	175.4	162.3	155.0	164.2	4.97
8750.6	324.7	341.5	333.6	310.3	5.75	156.3	162.0	149.4	143.4	152.8	5.75
8747.1	340.9	347.8	334.7	311.4	11.77	103.4	99.6	101.1	89.9	99.0	11.77

MINI EXCHANGER NUMBER 2					
OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS
155.7	176.4	153.7	166.4	163.1	.00
154.4	181.6	156.1	167.5	164.9	.48
149.2	173.2	146.7	155.6	155.2	1.00
143.5	173.0	147.4	154.6	154.6	1.48
147.6	165.5	150.5	155.6	154.8	1.98
148.7	166.9	161.1	157.6	158.6	3.25
153.1	171.2	161.7	157.4	160.9	4.08
159.3	172.9	164.5	160.0	164.2	4.97
163.7	178.1	165.2	158.1	166.3	5.75
103.0	107.7	89.9	87.2	96.9	11.77

MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS
146.3	155.5	135.0	129.8	141.6	.00
151.5	157.1	136.6	132.3	144.4	.48
140.6	145.8	133.8	126.6	136.7	1.00
143.2	145.1	136.3	128.4	138.2	1.48
145.0	142.9	134.4	127.5	137.4	1.98
152.2	143.6	134.1	127.9	139.4	3.25
151.5	148.0	139.5	127.6	141.6	4.08
153.3	144.8	144.6	125.9	142.1	4.97
155.2	145.7	142.7	129.0	145.4	5.75
147.9	133.8	108.5	111.0	125.3	11.77

THIS IS THE INPUT DATA FOR THE FOURTY NINTH RUN 2ND PART
THIS RUN STARTED FEBRUARY 16, 1978
THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 21 PPM
- C. SILICA : 425 PPM
- D. CARBONATE: 850 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS RUN HAD A ONE WEEK SHUTDOWN BETWEEN PARTS

FLOWS					
TIME	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O
HOURS	GAGE	GAGE	GAGE	GAGE	GALLONS
.00	6.0	6.0	6.2	34.0	98465.
.45	6.0	6.1	6.1	34.0	98842.
5.35	6.6	6.7	6.6	34.0	102949.
15.85	7.4	7.5	7.4	33.0	111810.
16.40	7.7	7.5	7.5	33.0	112276.

COOLING WATER TEMPERATURES IN DEG. F					
EXCH 1		EXCH 2		EXCH 3	
IN	OUT	IN	OUT	IN	OUT
70.8	82.0	60.1	70.8	52.9	60.1
70.2	80.6	60.1	70.2	53.0	60.1
64.5	74.1	55.6	64.5	48.8	55.6
60.4	67.9	53.8	60.4	49.0	53.8
61.4	69.0	54.7	61.4	49.7	54.7

EXCHANGER NUMBER 1 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
311.0	241.0	311.0	244.0	311.0	241.0	310.1	248.1
311.0	248.0	311.0	250.0	311.0	247.0	310.0	251.8
313.0	255.0	313.0	258.0	313.0	254.0	312.3	259.6
306.0	262.0	306.0	261.0	307.0	260.0	306.1	263.7
306.0	264.0	306.0	261.0	307.0	261.0	305.8	265.3

EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
241.0	177.0	244.0	178.0	241.0	181.0	248.1	178.0
248.0	188.0	250.0	190.0	247.0	190.0	251.8	190.0
255.0	207.0	258.0	207.0	254.0	203.0	259.6	207.0
262.0	226.0	261.0	221.0	260.0	223.0	263.7	223.0
264.0	230.0	261.0	223.0	261.0	226.0	265.3	226.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
177.0	141.0	178.0	144.0	181.0	135.0	178.0	147.7
186.0	152.0	190.0	145.0	190.0	149.0	190.0	155.6
207.0	163.0	207.0	164.0	203.0	164.0	207.0	170.8
226.0	192.0	221.0	190.0	223.0	190.0	223.0	196.0
230.0	197.0	223.0	192.0	226.0	195.0	226.0	199.8

RESULTS FROM THE FOURTY NINTH RUN 2ND PART
THIS RUN STARTED FEBRUARY 16, 1978
THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 33,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 21 PPM
- C. SILICA : 425 PPM
- D. CARBONATE: 850 PPM
- E. PH : 6.8
- F. ADDITIVE : NONE
- 1. LEVEL : NONE
- G. OTHER : THIS RUN HAD A ONE WEEK SHUTDOWN BETWEEN PARTS

FLOWRATES					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS
6951.1	274.3	291.8	297.1	318.4	.00
6956.2	274.3	296.7	292.0	318.5	.45
7013.0	303.7	325.6	317.1	318.1	5.35
7049.7	344.4	365.8	358.7	307.7	15.85
7005.3	359.3	365.8	363.8	309.7	16.40

MINI EXCHANGER NUMBER 1					
OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS
104.6	105.7	113.3	105.7	107.3	.00
92.5	96.4	100.3	98.5	96.9	.45
87.4	88.1	93.0	82.3	87.7	5.35
69.7	75.9	77.8	60.1	70.9	15.85
70.1	77.0	78.1	58.1	70.8	16.40

MINI EXCHANGER NUMBER 2					
OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS
132.5	143.4	132.3	164.3	143.1	.00
117.8	125.7	118.6	138.3	125.1	.45
91.6	103.5	103.3	103.9	100.6	5.35
67.6	81.1	73.3	69.0	72.7	15.85
67.3	78.6	71.4	67.6	71.2	16.40

MINI EXCHANGER NUMBER 3					
OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS
113.6	111.8	160.3	106.6	123.0	.00
98.1	136.4	119.8	106.1	115.1	.45
105.8	110.3	98.8	88.2	100.8	5.35
71.6	70.9	73.5	50.9	66.7	15.85
72.5	71.9	70.2	49.7	66.1	16.40

THIS IS THE INPUT DATA FOR THE FIFTIETH RUN

THIS RUN STARTED FEBRUARY 23, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 22 PPM

C. SILICA : 250 PPM

D. CARBONATE: 800 PPM

E. PH : 6.7

F. ADDITIVE : NONE

G. LEVEL : NONE

G. OTHER : THIS WAS A LASL SPECIFIED RUN WHEREBY THE SILICA/CARBONATE RATIO WAS CHANGED

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1	TUBE 2	TUBE 3	TUBE 4	COOL H2O	EXCH 1		EXCH 2		EXCH 3	
	GAGE	GAGE	GAGE	GAGE	GALLONS	IN	OUT	IN	OUT	IN	OUT
.00	5.6	5.6	5.7	32.0	119048.	75.5	87.0	64.8	75.5	55.3	64.8
.33	5.6	5.5	5.8	32.0	119303.	76.0	87.4	65.4	76.0	56.0	65.4
.95	5.6	5.6	5.7	32.0	119753.	77.1	88.5	66.6	77.1	57.1	66.6
2.78	5.7	5.7	5.7	32.0	121070.	80.2	91.7	69.6	80.2	59.8	69.6
4.23	5.8	5.8	5.9	32.0	122113.	78.7	89.4	68.6	78.7	59.1	68.6
4.95	5.8	5.8	5.8	32.0	122631.	77.6	88.0	67.7	77.6	58.4	67.7
11.75	5.0	5.3	6.0	36.0	127595.	68.6	77.2	59.9	68.6	50.5	59.9

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
312.0	246.0	312.0	254.0	312.0	241.0	310.1	243.7	246.0	195.0	254.0	199.0	241.0	189.0	243.7	193.0
313.0	248.0	313.0	256.0	314.0	243.0	312.1	246.5	248.0	196.0	256.0	201.0	243.0	192.0	246.5	198.0
315.0	250.0	315.0	257.0	316.0	246.0	314.3	250.8	250.0	197.0	257.0	202.0	246.0	194.0	250.8	198.0
317.0	254.0	317.0	263.0	318.0	252.0	315.8	252.0	254.0	201.0	263.0	208.0	252.0	198.0	252.0	204.0
312.0	251.0	312.0	261.0	313.0	251.0	310.2	251.1	251.0	201.0	261.0	208.0	251.0	202.0	251.1	205.0
312.0	253.0	312.0	263.0	313.0	253.0	310.3	252.2	253.0	203.0	263.0	210.0	253.0	204.0	252.2	207.0
322.0	254.0	322.0	282.0	322.0	278.0	321.3	282.1	254.0	194.0	282.0	238.0	278.0	240.0	282.1	239.6

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
195.0	141.0	199.0	149.0	189.0	143.0	193.0	147.4
196.0	142.0	201.0	150.0	192.0	145.0	198.0	149.5
197.0	143.0	202.0	151.0	194.0	146.0	198.0	153.1
201.0	148.0	208.0	157.0	198.0	151.0	204.0	155.6
201.0	150.0	208.0	159.0	202.0	155.0	205.0	158.6
203.0	152.0	210.0	162.0	204.0	157.0	207.0	160.3
194.0	145.0	238.0	189.0	240.0	190.0	239.6	195.5

RESULTS FROM THE FIFTIETH RUN

THIS RUN STARTED FEBRUARY 23, 1978

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM TOTAL DISSOLVED SOLIDS

B. CALCIUM : 22 PPM

C. SILICA : 250 PPM

D. CARBONATE: 800 PPM

E. PH : 6.7

F. ADDITIVE : NONE

G. LEVEL : NONE

G. OTHER : THIS WAS A LASL SPECIFIED RUN WHEREBY THE SILICA/CARBONATE RATIO WAS CHANGED

FLOWRATES						MINI EXCHANGER NUMBER 1					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
5849.5	254.4	272.2	271.6	299.7	.00	90.2	83.0	105.1	108.1	96.6	.00
6044.8	254.3	267.2	276.4	299.4	.33	89.8	81.0	107.9	107.4	96.5	.33
5953.7	254.0	271.8	271.1	299.1	.95	89.1	83.5	103.4	102.5	94.6	.95
5956.4	258.7	276.4	270.8	298.9	2.78	89.8	80.2	98.8	105.9	93.7	2.78
5985.4	264.3	281.9	281.6	299.7	4.23	88.3	76.6	95.4	97.4	89.4	4.23
6049.6	264.3	281.9	276.5	299.7	4.95	85.1	73.4	90.4	95.6	86.1	4.95
6027.0	223.6	256.3	285.4	335.4	11.75	77.9	49.1	60.7	63.1	62.7	11.75

MINI EXCHANGER NUMBER 2						MINI EXCHANGER NUMBER 3					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	BTU/HR. SQ.FT. DEG. F	HOURS
98.8	109.7	111.7	117.4	109.4	.00	143.6	134.0	132.2	138.9	137.2	.00
102.0	108.8	112.1	111.7	108.6	.33	142.9	133.1	134.9	143.8	138.7	.33
100.7	107.6	107.9	117.4	108.4	.95	143.7	136.3	135.5	132.5	137.0	.95
102.8	108.2	111.5	106.9	107.4	2.78	142.3	135.7	131.4	142.4	137.9	2.78
98.7	105.7	102.7	101.6	102.2	4.23	136.0	129.6	129.5	132.1	131.8	4.23
96.7	103.8	98.8	98.0	99.3	4.95	132.3	123.1	123.9	129.8	127.3	4.95
94.2	64.4	62.2	81.0	75.4	11.75	109.2	89.9	101.3	103.1	100.9	11.75

THIS IS THE INPUT DATA FOR THE FIFTY FIRST RUN

THIS RUN STARTED MARCH 7, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 20,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 24 PPM
- C. SILICA : 430 PPM
- D. CARBONATE: 860 PPM
- E. PH : 6.9
- F. ADDITIVE : NONE
- G. OTHER : THIS WAS A LAST SPECIFIED RUN WHEREBY THE TOTAL DISSOLVED SOLIDS WAS AT 20,000 PPM

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F							
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1		EXCH 2		EXCH 3			
						IN	OUT	IN	OUT	IN	OUT	IN	OUT
.00	5.7	5.7	5.7	32.0	136238.	80.3	95.5	71.2	80.3	65.8	71.2		
.50	5.6	5.6	5.7	32.0	136668.	82.1	96.8	72.6	82.1	66.9	72.6		
1.00	5.7	5.7	5.7	32.0	137052.	83.4	97.6	73.8	83.4	68.0	73.8		
2.12	5.7	5.6	5.7	32.0	138033.	84.1	95.9	75.0	84.1	68.3	75.0		
3.17	5.7	5.7	5.8	32.0	138925.	80.4	90.3	72.7	80.4	67.0	72.7		
3.85	5.8	5.8	5.7	32.0	139507.	81.1	90.9	73.4	81.1	67.4	73.4		
7.62	5.6	5.6	5.6	32.0	142691.	69.4	78.4	63.7	69.4	59.1	63.7		
8.47	5.7	5.6	5.5	31.5	143418.	68.0	75.4	62.7	68.0	58.2	62.7		
19.83	5.6	5.7	5.5	31.0	153105.	62.4	69.3	57.2	62.4	52.9	57.2		

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
309.0	212.0	309.0	219.0	310.0	203.0	307.3	206.7	212.0	160.0	219.0	161.0	203.0	155.0	206.7	154.6
311.0	219.0	311.0	224.0	311.0	212.0	308.9	213.1	219.0	166.0	224.0	167.0	212.0	160.0	213.1	156.2
311.0	223.0	311.0	227.0	311.0	215.0	308.7	216.0	223.0	169.0	227.0	170.0	215.0	162.0	216.0	159.5
311.0	237.0	311.0	241.0	312.0	237.0	310.0	237.5	237.0	186.0	241.0	188.0	237.0	184.0	237.5	183.6
313.0	250.0	313.0	255.0	314.0	250.0	311.9	251.6	250.0	205.0	255.0	209.0	250.0	204.0	251.6	208.6
312.0	248.0	312.0	252.0	313.0	251.0	311.2	253.2	248.0	202.0	252.0	207.0	251.0	205.0	253.2	210.1
302.0	249.0	302.0	252.0	303.0	241.0	299.7	242.9	249.0	216.0	252.0	220.0	241.0	206.0	242.9	211.0
302.0	253.0	302.0	258.0	303.0	254.0	299.7	255.1	253.0	224.0	258.0	230.0	254.0	222.0	255.1	225.1
303.0	262.0	303.0	262.0	304.0	257.0	300.3	255.6	262.0	230.0	262.0	232.0	257.0	226.0	255.6	225.1

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
160.0	124.0	161.0	129.0	165.0	128.0	154.8	128.6
165.0	128.0	167.0	132.0	160.0	132.0	158.2	131.5
169.0	130.0	170.0	134.0	162.0	134.0	159.5	133.0
166.0	143.0	188.0	148.0	184.0	148.0	183.6	148.2
205.0	167.0	209.0	174.0	204.0	174.0	208.6	174.3
202.0	164.0	207.0	170.0	205.0	173.0	210.1	175.9
216.0	184.0	220.0	192.0	206.0	188.0	211.3	182.7
224.0	194.0	230.0	203.0	222.0	199.0	225.2	195.4
230.0	200.0	232.0	204.0	226.0	200.0	225.1	196.4

RESULTS FROM THE FIFTY FIRST RUN

THIS RUN STARTED MARCH 7, 1978

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 20,000 PPM TOTAL DISSOLVED SOLIDS
- B. CALCIUM : 24 PPM
- C. SILICA : 430 PPM
- D. CARBONATE: 860 PPM
- E. PH : 6.9
- F. ADDITIVE : NONE
- G. OTHER : THIS WAS A LAST SPECIFIED RUN WHEREBY THE TOTAL DISSOLVED SOLIDS WAS AT 20,000 PPM

FLOWRATES						MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	TIME HOURS	
7116.3	259.7	277.4	271.8	300.1	.00	162.7	157.3	194.0	199.8	178.4	.00	
6353.4	254.5	272.3	271.7	299.9	.50	142.1	141.3	167.5	179.0	157.5	.50	
7264.2	259.5	277.2	271.7	299.9	1.00	146.3	147.2	172.0	183.7	162.3	1.00	
7029.0	259.5	272.3	271.6	299.7	2.12	116.9	114.6	123.7	132.4	121.9	2.12	
7058.4	259.2	276.9	276.4	299.5	3.17	92.4	89.6	99.9	102.0	96.0	3.17	
7000.5	264.3	281.9	271.5	299.6	3.85	96.0	94.9	94.5	97.3	95.7	3.85	
7101.5	255.6	273.5	267.7	301.2	7.62	75.2	75.3	93.9	97.0	85.3	7.62	
7080.7	260.6	273.5	262.6	296.5	8.47	68.6	63.9	68.8	71.1	68.1	8.47	
7074.1	255.5	278.2	262.4	291.7	19.83	53.5	58.3	63.6	68.0	60.9	19.83	

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS
142.9	144.9	147.3	173.4	157.1	.00	151.0	136.8	118.1	126.0	133.0	.00
130.0	146.2	144.6	169.5	147.6	.50	141.0	133.9	111.1	118.6	126.1	.50
141.0	155.9	155.1	184.5	159.1	1.00	155.3	147.6	117.6	125.6	136.5	1.00
115.4	123.1	126.6	142.1	126.8	2.12	139.6	130.8	119.6	129.8	129.9	2.12
87.8	93.1	96.1	95.1	93.0	3.17	94.9	89.0	77.5	94.3	88.9	3.17
92.9	94.1	93.5	94.2	93.7	3.85	100.3	99.3	82.1	93.8	93.9	3.85
58.4	59.4	68.7	68.2	63.7	7.62	67.6	60.6	40.6	72.7	60.4	7.62
50.9	50.1	56.8	59.2	54.3	8.47	58.7	52.7	44.8	65.7	53.5	8.47
49.9	50.7	50.8	55.9	51.8	19.83	51.6	51.5	46.5	57.9	51.9	19.83

THIS IS THE INPUT DATA FOR THE FIFTY SECOND RUN
 THIS RUN STARTED MARCH 13, 1978
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 20,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 24 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 6.9
 F. ADDITIVE : THERMOSOL APS
 1. LEVEL : 13 PPM
 G. OTHER :

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	5.9	6.0	5.9	33.0	160279.	77.5	91.5	68.9	77.5	63.7	68.9
.43	6.0	6.1	6.0	33.0	160684.	77.6	90.5	68.6	77.6	63.1	68.6
1.20	6.1	6.2	6.1	33.0	161395.	76.9	87.7	68.8	76.9	62.9	68.8
2.18	6.4	6.5	6.2	33.0	162322.	75.9	85.3	68.1	75.9	62.4	68.1
2.93	6.4	6.5	6.5	33.0	163032.	75.9	85.0	68.6	75.9	63.0	68.6
4.67	6.6	6.7	6.6	33.0	164729.	76.2	84.7	69.1	76.2	63.5	69.1
7.43	7.1	7.1	6.9	33.0	167380.	73.4	79.6	67.3	73.4	62.1	67.3
19.03	7.5	7.5	6.7	33.0	178606.	67.8	72.1	63.5	67.8	59.1	63.5
19.68	7.2	7.2	7.1	33.0	179238.	68.7	73.0	64.3	68.7	59.9	64.3

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
308.0	208.0	308.0	218.0	309.0	201.0	306.7	211.1	208.0	162.0	218.0	162.0	201.0	155.0	211.1	157.9
307.0	216.0	307.0	223.0	307.0	211.0	304.0	217.1	216.0	168.0	223.0	167.0	211.0	160.0	217.1	162.1
305.0	230.0	305.0	235.0	305.0	227.0	303.4	231.6	230.0	182.0	235.0	185.0	227.0	178.0	231.6	183.7
306.0	236.0	306.0	243.0	306.0	234.0	303.6	237.0	236.0	190.0	243.0	195.0	234.0	189.0	237.0	193.1
306.0	242.0	306.0	249.0	307.0	242.0	305.3	244.5	242.0	195.0	249.0	201.0	242.0	196.0	244.5	201.2
305.0	244.0	305.0	252.0	306.0	244.0	303.3	246.3	244.0	198.0	252.0	205.0	244.0	200.0	246.3	203.6
312.0	266.0	312.0	272.0	312.0	267.0	310.3	268.3	266.0	226.0	272.0	234.0	267.0	230.0	268.3	232.1
310.0	280.0	310.0	282.0	311.0	279.0	309.5	281.0	280.0	251.0	282.0	256.0	279.0	250.0	281.0	253.5
314.0	284.0	314.0	286.0	315.0	285.0	313.4	285.9	284.0	254.0	286.0	259.0	285.0	255.0	285.9	259.2

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
167.0	124.0	162.0	130.0	155.0	124.0	157.9	129.5
168.0	128.0	167.0	133.0	160.0	128.0	162.1	131.7
182.0	140.0	185.0	148.0	178.0	142.0	183.7	146.4
190.0	150.0	195.0	159.0	189.0	152.0	193.1	156.0
195.0	154.0	201.0	165.0	196.0	160.0	201.2	163.3
198.0	158.0	205.0	169.0	200.0	163.0	203.6	165.7
226.0	187.0	234.0	199.0	230.0	194.0	232.1	194.2
251.0	220.0	256.0	230.0	250.0	218.0	253.5	218.9
254.0	221.0	259.0	231.0	255.0	224.0	259.2	224.7

RESULTS FROM THE FIFTY SECOND RUN
 THIS RUN STARTED MARCH 13, 1978
 THE CONDITIONS OF THIS RUN WERE:
 A. SALINITY : 20,000 PPM TOTAL DISSOLVED SOLIDS
 B. CALCIUM : 24 PPM
 C. SILICA : 400 PPM
 D. CARBONATE: 800 PPM
 E. PH : 6.9
 F. ADDITIVE : THERMOSOL APS
 1. LEVEL : 13 PPM
 G. OTHER :

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						TIME HOURS
COOL H2O LB/HR	TUBE1 LB/HR	TUBE2 LB/HR	TUBE3 LB/HR	TUBE4 LB/HR	TIME HOURS	TUBE1 BTU/HR. SQ.FT. DEG. F	TUBE2 BTU/HR. SQ.FT. DEG. F	TUBE3 BTU/HR. SQ.FT. DEG. F	TUBE4 BTU/HR. SQ.FT. DEG. F	AVERAGE	
7745.9	269.7	292.2	282.1	309.6	.00	170.6	160.5	197.5	185.6	178.6	.00
7678.3	274.8	297.2	287.5	310.0	.43	152.8	148.9	171.6	165.1	159.6	.43
7815.5	280.1	302.4	292.9	310.1	1.20	122.9	121.9	134.9	130.0	127.4	1.20
7849.4	294.8	316.9	297.8	310.0	2.18	112.5	106.7	117.6	112.9	112.4	2.18
8119.9	294.8	316.9	312.9	309.8	2.93	105.2	98.8	113.2	104.4	105.4	2.93
7945.0	304.9	326.9	318.2	310.1	4.67	100.7	91.7	106.6	95.4	98.6	4.67
8033.4	328.6	345.3	332.5	309.0	7.43	72.7	65.4	71.7	62.3	68.0	7.43
8083.3	348.7	365.1	322.5	309.2	19.03	47.3	46.0	46.7	39.8	45.0	19.03
8006.2	333.2	349.8	342.1	308.6	19.68	45.1	44.0	46.1	38.2	43.4	19.68

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS					MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS						TIME HOURS
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME HOURS	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	
130.6	166.0	146.1	175.2	154.5	.00	153.8	133.8	136.6	129.2	138.3	.00
129.2	159.9	152.6	171.5	153.3	.43	152.2	135.6	133.0	131.0	137.9	.43
115.6	126.4	126.9	126.2	123.8	1.20	137.2	122.7	123.7	128.8	128.1	1.20
110.0	118.5	109.9	108.7	111.8	2.18	121.5	109.8	112.8	113.3	114.4	2.18
105.4	110.8	109.1	98.9	106.1	2.93	120.0	104.6	107.9	108.4	110.2	2.93
102.7	107.1	101.7	94.3	101.5	4.67	115.2	102.5	107.5	104.5	107.4	4.67
80.6	77.4	74.3	67.0	74.8	7.43	91.1	80.2	81.8	79.5	83.1	7.43
52.9	48.8	47.1	44.1	48.7	19.03	62.4	52.6	60.1	61.5	59.1	19.03
51.6	47.9	52.7	41.8	48.5	19.68	62.3	53.2	59.4	58.9	58.4	19.68

THIS IS THE INPUT DATA FOR THE FIFTY THIRD RUN
THIS RUN STARTED 9/27/78
THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM
B. CALCIUM : 25 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 6.7
F. ADDITIVE : DEQUEST 2060
1. LEVEL : 10 PPM
G. OTHER : NONE

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.0	6.0	6.0	32.0	402158.	90.4	105.0	82.5	90.4	77.8	82.5
.57	6.0	6.0	6.0	32.0	402652.	92.1	106.7	83.9	92.1	79.1	83.9
1.12	6.0	6.0	6.0	32.0	403130.	92.9	107.4	84.7	92.9	79.9	84.7
1.88	6.1	6.0	6.0	32.0	403799.	94.3	108.7	86.0	94.3	81.0	86.0
3.20	6.2	6.0	6.0	32.0	404940.	97.9	111.4	89.5	97.9	84.5	89.5
4.18	6.2	6.1	6.0	32.0	405785.	98.1	111.2	89.5	98.1	84.5	89.5
5.55	6.3	6.1	6.0	32.0	406963.	99.9	112.5	91.3	99.9	86.2	91.3
6.57	6.3	6.1	6.0	32.0	407842.	99.4	111.7	90.9	99.4	85.6	90.9
10.27	6.3	6.0	6.3	32.0	410973.	92.9	102.0	85.7	92.9	80.3	85.7
12.60	5.9	5.9	5.8	32.0	412978.	89.4	98.3	82.5	89.4	76.7	82.5
21.92	6.9	6.9	6.7	32.0	420910.	83.9	90.5	78.7	83.9	74.5	78.7
24.34	6.5	6.5	6.3	32.0	422962.	84.2	91.6	79.3	84.2	75.5	79.3
27.04	6.4	6.4	6.2	32.0	425278.	84.3	91.8	79.6	84.3	75.9	79.6

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
304.0	207.0	305.0	210.0	304.0	222.0	303.0	206.0	207.0	164.0	210.0	158.0	222.0	157.0	206.0	158.0
305.0	208.0	307.0	212.0	306.0	224.0	304.0	209.0	208.0	165.0	212.0	160.0	224.0	158.0	209.0	161.0
306.0	211.0	308.0	214.0	306.0	225.0	304.0	211.0	211.0	167.0	214.0	161.0	225.0	159.0	211.0	162.0
306.0	213.0	308.0	216.0	306.0	226.0	304.0	213.0	213.0	169.0	216.0	164.0	226.0	161.0	213.0	163.0
306.0	216.0	308.0	220.0	307.0	230.0	305.0	219.0	216.0	173.0	220.0	167.0	230.0	165.0	219.0	167.0
307.0	219.0	309.0	223.0	307.0	232.0	305.0	222.0	219.0	175.0	223.0	170.0	232.0	167.0	222.0	170.0
307.0	222.0	309.0	226.0	307.0	233.0	305.0	226.0	222.0	177.0	226.0	172.0	233.0	170.0	226.0	173.0
306.0	225.0	307.0	228.0	305.0	233.0	304.0	228.0	225.0	179.0	228.0	174.0	233.0	172.0	228.0	176.0
306.0	248.0	308.0	250.0	306.0	250.0	304.0	249.0	248.0	209.0	250.0	203.0	250.0	196.0	249.0	205.0
304.0	247.0	307.0	250.0	305.0	250.0	302.0	248.0	247.0	209.0	250.0	205.0	250.0	197.0	248.0	208.0
304.0	261.0	307.0	262.0	305.0	266.0	303.0	265.0	261.0	230.0	262.0	228.0	266.0	230.0	265.0	235.0
303.0	251.0	302.0	251.0	302.0	264.0	301.0	261.0	251.0	224.0	251.0	222.0	264.0	226.0	261.0	232.0
304.0	254.0	307.0	258.0	305.0	262.0	302.0	258.0	254.0	227.0	258.0	228.0	262.0	227.0	258.0	231.0

IN	OUT	IN	OUT	IN	OUT	IN	OUT
164.0	129.0	158.0	129.0	157.0	129.0	158.0	131.0
165.0	130.0	160.0	130.0	158.0	130.0	161.0	133.0
167.0	132.0	161.0	131.0	159.0	131.0	162.0	134.0
169.0	133.0	164.0	133.0	161.0	132.0	163.0	135.0
173.0	137.0	167.0	136.0	165.0	136.0	167.0	139.0
175.0	138.0	170.0	137.0	167.0	137.0	170.0	140.0
177.0	140.0	172.0	140.0	170.0	139.0	173.0	143.0
179.0	141.0	174.0	141.0	172.0	140.0	176.0	144.0
209.0	170.0	203.0	169.0	196.0	163.0	205.0	170.9
209.0	165.0	205.0	166.0	197.0	165.0	208.0	171.0
230.0	197.0	228.0	199.0	230.0	201.0	235.0	202.0
224.0	194.0	222.0	196.0	226.0	198.0	232.0	201.0
227.0	198.0	228.0	202.0	227.0	201.0	231.0	201.0

RESULTS FROM THE FIFTY THIRD RUN
THIS RUN STARTED 9/27/78

THE CONDITIONS OF THIS RUN WERE:

A. SALINITY : 32,000 PPM
B. CALCIUM : 25 PPM
C. SILICA : 400 PPM
D. CARBONATE: 800 PPM
E. PH : 6.7
F. ADDITIVE : DEQUEST 2060
1. LEVEL : 10 PPM
G. OTHER : NONE

FLOWRATES					MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS						
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS		BTU/HR.	SQ.FT.	DEG. F		HOURS
7157.9	275.2	292.6	287.9	300.7	.00	188.4	193.3	157.0	207.3	186.5	.00
7175.4	275.1	292.4	287.6	300.6	.57	190.1	193.6	157.3	203.1	186.0	.57
7266.7	275.0	292.2	287.6	300.6	1.12	186.3	192.6	157.3	200.4	184.1	1.12
7133.8	279.9	292.2	287.6	300.6	1.88	184.9	187.7	155.3	195.2	180.8	1.88
7112.2	284.9	292.2	287.5	300.4	3.20	181.0	177.7	147.6	180.7	171.7	3.20
7092.8	284.8	297.0	287.5	300.4	4.18	173.4	173.0	141.9	171.3	164.9	4.18
7106.7	289.7	297.0	287.5	300.4	5.55	169.4	166.1	140.3	161.6	159.3	5.55
6979.6	289.8	297.2	287.8	300.6	6.57	159.2	157.0	136.7	153.9	151.7	6.57
7111.3	289.8	292.2	302.9	300.6	10.27	100.6	100.3	100.9	99.1	100.2	10.27
7038.5	270.3	287.5	277.6	300.9	12.60	92.3	96.6	90.5	97.5	94.2	12.60
7023.5	319.9	336.3	323.4	300.7	21.92	71.9	78.4	64.9	59.2	68.6	21.92
7103.4	300.2	317.5	303.5	301.0	24.34	87.8	91.3	62.7	66.2	77.0	24.34
7080.4	295.1	311.9	297.9	300.9	27.04	82.0	83.5	69.5	73.1	77.0	27.04

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
					HOURS						HOURS
	BTU/HR. SQ.FT. DEG. F						BTU/HR. SQ.FT. DEG. F				
127.3	167.8	197.8	162.0	163.7	.00	159.1	145.8	139.4	136.9	145.3	.00
130.3	169.9	204.7	162.3	166.8	.57	160.5	151.1	140.7	140.0	148.1	.57
131.0	171.9	204.1	164.5	167.9	1.12	158.5	151.5	141.1	140.5	147.9	1.12
132.1	166.0	199.9	167.4	166.3	1.88	164.9	153.0	145.2	140.5	150.9	1.88
131.1	169.2	198.6	171.4	167.5	3.20	165.9	153.7	143.4	138.7	150.4	3.20
131.8	167.8	195.9	167.3	165.7	4.18	162.3	157.2	141.1	140.6	150.3	4.18
135.9	169.4	188.5	167.2	165.2	5.55	165.8	151.7	145.5	139.2	150.6	5.55
133.7	163.7	177.7	157.5	158.1	6.57	164.2	150.8	144.6	142.2	150.4	6.57
85.5	105.8	129.9	101.4	105.6	10.27	111.4	101.0	108.5	102.2	105.8	10.27
77.5	98.2	115.4	90.8	95.5	12.60	117.9	112.4	92.6	107.3	107.6	12.60
61.1	70.7	70.8	54.1	64.2	21.92	72.7	67.1	63.6	66.0	67.3	21.92
54.2	62.0	73.8	55.3	61.3	24.34	65.4	59.9	60.3	64.1	62.4	24.34
52.4	60.6	67.0	52.1	58.0	27.04	61.2	56.9	54.7	62.9	58.9	27.04

THIS IS THE INPUT DATA FOR THE FIFTY FOURTH RUN
THIS RUN STARTED 10-3-78

THE CONDITIONS OF THIS RUN WERE:

- A. SALINITY : 32000 PPM
- B. CALCIUM : 20 PPM
- C. SILICA : 390 PPM
- D. CARBONATE: 780 PPM
- E. PH : 6.7
- F. ADDITIVE : DEQUEST 2060
- 1. LEVEL : 20 PPM
- G. OTHER : NONE

TIME HOURS	FLOWS					COOLING WATER TEMPERATURES IN DEG. F					
	TUBE 1 GAGE	TUBE 2 GAGE	TUBE 3 GAGE	TUBE 4 GAGE	COOL H2O GALLONS	EXCH 1 IN	EXCH 1 OUT	EXCH 2 IN	EXCH 2 OUT	EXCH 3 IN	EXCH 3 OUT
.00	6.0	6.1	6.0	32.0	426685.	85.7	98.5	78.9	85.7	74.9	78.9
.58	6.0	6.0	6.0	33.0	427294.	87.6	100.4	80.7	87.6	76.4	80.7
1.02	6.0	6.0	6.0	33.0	427748.	89.0	101.7	82.1	89.0	78.1	82.1
2.35	6.1	6.0	6.1	33.0	429146.	92.8	104.9	85.8	92.8	81.8	85.8
4.15	6.2	6.1	6.0	33.0	431049.	97.0	107.4	89.8	97.0	85.4	89.8
5.60	6.2	6.1	6.1	33.0	432561.	98.5	107.7	91.8	98.5	86.8	91.8
6.33	6.3	6.2	6.3	33.0	433320.	98.1	106.7	91.9	98.1	86.9	91.9
7.28	6.4	6.3	6.2	33.0	434294.	97.8	106.0	91.7	97.8	86.9	91.7
11.48	6.5	6.4	6.4	33.0	438651.	88.3	94.7	83.5	88.3	79.7	83.5
22.65	6.0	6.0	6.0	32.0	450454.	85.2	89.5	81.8	85.2	79.0	81.8

EXCHANGER NUMBER 1 TEMPS IN DEG. F								EXCHANGER NUMBER 2 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
306.0	208.0	306.0	208.0	306.0	217.0	305.0	205.0	208.0	164.0	208.0	155.0	217.0	155.0	205.0	158.0
309.0	212.0	309.0	210.0	309.0	218.0	308.0	206.0	212.0	167.0	210.0	156.0	218.0	158.0	206.0	160.0
309.0	213.0	309.0	209.0	309.0	219.0	307.0	207.0	213.0	167.0	209.0	157.0	219.0	159.0	207.0	161.0
310.0	220.0	310.0	215.0	310.0	226.0	309.0	212.0	220.0	172.0	215.0	161.0	226.0	165.0	212.0	165.0
310.0	232.0	311.0	230.0	310.0	234.0	309.0	228.0	232.0	182.0	230.0	172.0	234.0	173.0	228.0	177.0
311.0	243.0	313.0	240.0	312.0	244.0	310.0	241.0	243.0	197.0	240.0	188.0	244.0	190.0	241.0	195.0
311.0	247.0	312.0	246.0	312.0	250.0	310.0	246.0	247.0	204.0	246.0	196.0	250.0	199.0	246.0	203.0
310.0	249.0	311.0	248.0	310.0	250.0	308.0	248.0	249.0	207.0	248.0	200.0	250.0	201.0	248.0	207.0
308.0	259.0	310.0	259.0	309.0	261.0	306.0	260.0	259.0	223.0	259.0	221.0	261.0	224.0	260.0	227.0
307.0	275.0	309.0	275.0	308.0	272.0	306.0	279.0	275.0	250.0	275.0	246.0	272.0	244.0	279.0	257.0

EXCHANGER NUMBER 3 TEMPS IN DEG. F							
IN	OUT	IN	OUT	IN	OUT	IN	OUT
164.0	128.0	155.0	125.0	155.0	124.0	158.0	127.0
167.0	131.0	156.0	127.0	158.0	126.0	160.0	129.0
167.0	132.0	157.0	128.0	159.0	128.0	161.0	130.0
172.0	136.0	161.0	132.0	165.0	133.0	165.0	134.0
182.0	144.0	172.0	140.0	173.0	139.0	177.0	141.0
197.0	157.0	188.0	151.0	190.0	151.0	195.0	153.0
204.0	164.0	196.0	159.0	199.0	160.0	203.0	160.0
207.0	168.0	200.0	164.0	201.0	163.0	207.0	164.0
223.0	192.0	221.0	191.0	224.0	192.0	227.0	189.0
250.0	224.0	246.0	223.0	244.0	219.0	257.0	231.0

RESULTS FROM THE FIFTY FOURTH RUN
THIS RUN STARTED 10-3-78
THE CONDITIONS OF THIS RUN WERE:
A. SALINITY : 32000 PPM
B. CALCIUM : 20 PPM
C. SILICA : 390 PPM
D. CARBONATE: 780 PPM
E. PH : 6.7
F. ADDITIVE : DEQUEST 2060
1. LEVEL : 20 PPM
G. OTHER. : NONE

FLOWRATES						MINI EXCHANGER NUMBER 1 OVERALL HEAT TRANSFER COEFFICIENTS					
COOL H2O	TUBE1	TUBE2	TUBE3	TUBE4	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
LB/HR	LB/HR	LB/HR	LB/HR	LB/HR	HOURS	BTU/HR. SQ.FT. DEG. F					HOURS
8683.3	275.0	297.4	287.6	300.4	.00	183.2	198.1	168.2	207.2	189.1	.00
8529.7	274.6	292.1	287.2	309.4	.58	176.3	192.9	169.2	214.5	188.2	.58
8687.1	274.6	292.1	287.2	309.5	1.02	177.0	199.2	169.6	213.8	189.9	1.02
8731.8	279.4	291.9	292.2	309.2	2.35	167.7	188.6	160.1	206.9	180.8	2.35
8608.1	284.3	296.7	287.1	309.2	4.15	142.8	155.4	139.5	164.0	150.4	4.15
8582.5	284.2	296.4	291.9	309.1	5.60	120.0	135.0	122.5	133.6	127.8	5.60
8464.8	289.2	301.4	302.0	309.1	6.33	112.0	120.5	112.0	120.4	116.2	6.33
8566.1	294.2	306.4	297.2	309.4	7.28	108.3	116.6	107.3	112.9	111.3	7.28
8745.1	299.5	311.4	307.5	309.7	11.48	80.9	87.1	80.7	78.6	81.8	11.48
8694.0	274.8	292.1	287.4	300.3	22.65	47.1	52.9	55.7	43.1	49.7	22.65

MINI EXCHANGER NUMBER 2 OVERALL HEAT TRANSFER COEFFICIENTS						MINI EXCHANGER NUMBER 3 OVERALL HEAT TRANSFER COEFFICIENTS					
TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME	TUBE1	TUBE2	TUBE3	TUBE4	AVERAGE	TIME
	BTU/HR. SQ.FT. DEG. F				HOURS		BTU/HR. SQ.FT. DEG. F				HOURS
127.2	175.0	190.8	155.8	162.2	.00	153.2	150.5	152.0	151.1	151.7	.00
127.9	176.0	183.8	157.5	161.3	.58	150.5	143.7	155.3	155.4	151.2	.58
133.6	173.8	186.8	160.2	163.6	1.02	148.8	145.3	150.7	157.2	150.5	1.02
137.8	176.8	186.4	161.0	165.5	2.35	152.7	143.2	152.5	154.9	150.8	2.35
134.7	173.8	173.1	155.9	159.4	4.15	151.6	146.4	150.9	164.9	153.4	4.15
113.6	141.3	141.1	125.5	130.4	5.60	136.6	144.1	148.0	162.1	147.7	5.60
100.4	126.6	125.9	108.2	115.3	6.33	126.2	130.6	135.0	149.5	135.3	6.33
99.1	122.0	119.5	102.1	110.7	7.28	119.5	121.6	124.7	142.0	126.9	7.28
73.5	81.2	76.8	68.5	75.0	11.48	72.8	74.1	76.9	92.2	79.0	11.48
41.3	51.5	49.6	38.5	45.2	22.65	45.4	43.3	47.3	47.6	45.9	22.65