WSRC-TR-2002-00550, Rev. 0

SRT-RPP-2002-00274

KEYWORDS:
River Protection Project
Laboratory
Evaporation
Offgas Emissions

RETENTION TIME:
Permanent

Waste Feed Evaporator Off-Gas Emissions Modeling

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Issue Date: **December 4, 2002**

Test Specification No. **24590-PTF-TSP-RT-01-006, Rev. 0**

Test Plan No. **WSRC-TR-2002-00262, Rev. 0**

Test Scoping Statement: **S-89**

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Prepared for the U.S. Department of Energy Under Contract Number DE-AC09-96SR18500

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Completeness of Testing

This report describes the results of work and testing specified by 24590-WTP-TSP-RT-01-006, Rev. 0 and WSRC-TR-2002-00262, Rev. 0.. The performed work followed established quality assurance requirements and was conducted as authorized. The descriptions provided in this test report are an accurate account of both the conduct of the work and the data collected. Results required by the test plan are reported. Also reported are any unusual or anomalous occurrences that are different from starting hypotheses. The test results and this report have been reviewed and verified.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AA	Atomic Absorption
FEP	Feed Evaporator Process
HLW	High Activity Waste
IC	Ion Chromatography
ICPES	Inductively Coupled Plasma Emissions Spectroscopy
LAW	Low Activity Waste
RPP	River Protection Project
SRTC	Savannah River Technology Center
SBS	Submerged Bed Scrubber
TOC	Total Organic Carbon
UF	Ultrafiltration
WTP	Waste Treatment Plant
XRD	X-ray Diffraction

Summary of Testing

A. Objectives

The goals of this task were:

A. Expand the waste feed evaporator model by including all the major components of the evaporator off-gas treatment system

B. Develop two test cases by defining the baseline untreated waste feed composition, target organic components to be tracked, and the waste-to-recycle blend ratio

C. Develop air emissions projections for the two test cases using the expanded waste feed evaporator model

D. Validate organic partitioning predictions and air emission projections against experimental data obtained during pilot evaporator tests

The first three objectives were accomplished and objective D will be performed once the pilot test data is available.

B. Conduct of Testing

The Environmental Simulation Program (ESP) software licensed by OLI Systems, Inc. was used to model the waste feed evaporator and the offgas treatment system. OLI ESP is a steady state simulation package that performs vapor/liquid/solid equilibrium for electrochemical streams and processes. For the waste feed evaporator and offgas modeling the following private OLI databooks were used: Carbonat, Zeolite, Silica, and HNO3DB. The details for the waste feed evaporator model are discussed in another task plan[1]. The baseline waste feed and SBS recycle stream data was provided by Alex Choi from analytical data for the representative Envelope B/D samples[2,3], whose TOC levels are lower than those of Envelope C. To bound the air emission projections, the baseline Envelope B/D feeds were spiked in this task with additional organics to increase the total organic carbon (TOC) level to that of Envelope C or approximately 1 PPM. The waste feed rate was set to produce 30 Mton/day of 17 wt% Na_2O glass.

C. Results and Performance against Objectives

In a prior study[4,5] fourteen target organic species representing the volatile, semi-volatile, and nonvolatile organics of the waste feeds were spiked into the treated evaporator feed. The partitioning of these organics in the evaporator pot and in the primary condenser was measured in lab-scale equipment. The lab measured values agreed well with the OLI ESP model predictions for most organics except pentachlorophenol, pyrene, and Aldrin. This prior study showed that all volatiles and light semi-volatiles would exit the evaporator system through the off-gas, while the heavier semi-volatiles remain predominantly in the evaporator concentrate. The offgas regulatory runs for this task were compared with this prior study to help validate the model. The current offgas runs showed that more of the volatiles and semi-volatiles in the feed go out the condensate stream of the evaporator than the earlier runs due to the large amount of HLW Offgas Condensate (SBS Recycle) being sent to the waste feed evaporator. The extra water

[1] Laurinat, J. E., and A. S. Choi, "Task Technical and Quality Assurance Plan for Waste Feed Evaporation and Physical Properties Modeling," WSRC-TR-2002-00083, SRT-RPP-2002-00036, Rev. 0, Westinghouse Savannah River Co., Aiken, SC, April, 2002.
[2] Schreiber, Ruth D., "Tank Characterization Report for Double-Shell Tank 241-AZ-102", WHC-SD-WM-ER-411 Rev. 0-A, Westinghouse Hanford Company, Richland, WA, December 1995.
[3] Tank Farm Contractor Operation and Utilization Plan (TFCOUP), HNF-SD-WM-SP-012, Rev. 3, Numatec Hanford Corporation and CH2MHILL Hanford Group, Inc., Richland, WA, September 1991.
[4] Saito, H. H., T. B. Calloway, D. M. Ferrara, A. S. Choi, T. L White, L. V. Gibson, and M. A. Burdette, "Simulant Bench-Scale LAW Evaporation with Organic Regulatory Analysis," SRT-RPP-2000-00047, Westinghouse Savannah River Co., Aiken, SC, 2001.
[5] Choi, A. S., "Preliminary Modeling Results of Pretreated LAW Evaporator," BNF-003-98-0080, Rev. 0, Westinghouse Savannah River Co., Aiken, SC, June 1, 1999.

and species in the HLW Offgas Condensate stream caused the vapor/liquid equilibrium according to OLI to shift in the evaporator so more of the volatiles and semi-volatiles go out the evaporator overhead and end up being condensed out in the primary condenser. Several runs were made with the prior OLI model and the new waste feed evaporator offgas model to confirm this behavior. From these comparisons, adjusting the evaporator vapor target does have a significant impact on the organic partitioning. The amount of water entering the evaporator from the recycle streams also has a significant impact.

This work does not reflect the true conditions of mercury in the waste feed evaporator. For this reason it is strongly suggested that the mercury calculations not be used in the evaporator engineering calculations for design. SRTC will be conducting experiments to attempt to provide a mercury mass balance across the waste feed evaporator.[6] This new work will be better suited for mercury analysis and engineering design calculations.

The mercury partitioning in the offgas system for the conditions assumed is fairly straightforward based on the OLI modeling. Any elemental mercury in the feed goes out the evaporator overhead. For this particular model setup soluble mercury was represented as mercuric chloride. About 5% of the mercuric chloride goes out the overhead while the remaining portion goes out the evaporator bottoms. No other forms of mercury were predicted to go out the evaporator overhead other than elemental mercury and mercuric chloride. All the insoluble mercury goes out the evaporator bottoms. In these OLI models the insoluble mercury was represented as mercuric oxide. How much mercury that's predicted to go out the evaporator overhead depends on the assumed amount of elemental mercury in the feed and the assumed reduction of insoluble mercury in the feed to elemental mercury. For the offgas regulatory runs a 50% reduction of mercuric oxide to elemental mercury was assumed to show the effect of mercury redox. The actual RPP feed has not been shown to have any potential to reduce mercury. This assumption of mercury redox was made to show the effect should it occur. If there is no elemental mercury in the waste feed and no mercury redox is assumed for the waste feed then OLI predicts essentially no mercury will go out the overhead stream. Any insoluble mercury in the waste feed that is not reduced will go out the evaporator bottoms based on OLI predictions.

D. Quality Requirements

The quality requirements for this work were documented in the Task Technical and Quality Assurance Plan for Waste Feed Evaporator Off-Gas Emissions Modeling (WSRC-TR-2002-00262). The WSRC Quality Assurance Program was followed, which has been approved by WTP, and the WSRC Quality Assurance Management Plan (WSRC-RP-92-225). This program applied the appropriate quality assurance requirements for this task from NQA-1-1989, and NQA-2a-1990, Part 2.7, as indicated by the QA plan (WSRC-TR-2002-00262). Modeling results were compared to prior modeling and experimental results to confirm model predictions.

E. Issues

In gathering data for the two offgas runs, several runs were done to investigate mercury redox. Based on these runs it appears that the built-in redox for mercury must be modified to more closely match observed mercury redox behavior. Some redox behavior can be inserted into the OLI chemistry model by using kinetic equations. However, the reduction and oxidation are then forced to fit a desired result rather than following standard redox chemistry. The mercury redox behavior in OLI should be studied further so it can be refined to more closely match experimental data. Further, the behavior of soluble and insoluble forms of mercury in OLI needs to be investigated to address concerns over the partitioning of mercury between the evaporator overhead and bottoms.

[6] Stone, M. A. "Task Technical and Quality Assurance Plan for Waste Feed: Simulant Evaporation and Physical Properties Determination." WSRC-TR-2002-00039, SRT-RPP-2002-00013, Westinghouse Savannah River Company, Aiken, SC, 2002.

In collecting data for the two offgas runs, several runs were made with different amounts of water coming into the offgas train from the feed streams as well as the steam ejectors and recycle streams. The organic partitioning is significantly impacted by the amount of water being fed into the system due to the volatility of the organics and their solubility in water. The amount of water can be controlled by the amount of excess steam going to the steam ejectors as well as the amount of HLW offgas condensate (SBS Recycle) and Ultrafiltration caustic wash that are recycled back to the evaporator. More studies are needed to quantify the impacts of these variables.

0.0 INTRODUCTION

The objectives of this task given in the test specification were to expand the waste feed evaporator OLI model by including all the major components of the evaporator off-gas treatment system. Also as part of this task, two test cases were developed that defined the baseline untreated waste feed composition, target organic components to be tracked, and the waste-to-recycle blend ratio. The goal of this task was to develop air emissions projections for two test cases using the expanded waste feed evaporator OLI model. The organic partitioning predictions and air emission projections are ultimately to be validated against experimental data obtained during pilot evaporator tests.

The Environmental Simulation Program (ESP) software, licensed by OLI Systems, Inc., was used to build the current as well as earlier models for the FEP[7]. The steady state simulation package performs vapor/liquid/solid equilibrium for electrochemical streams and processes. All vapor/liquid/solid equilibrium is determined by the OLI simulation engine. OLI uses public and private databooks of component data to predict various components' properties. The private databooks used in this modeling task were Carbonat, Zeolite, Silica, and HNO3DB. These databooks were developed in cooperation with OLI Systems.

This task partially satisfied the test conditions and requirements described in Section 3.4 of the *Research and Technology Plan*, (PL-W375-TE00007, Rev. 0) prepared by Bechtel National, Inc. (BNI). Specifically, BNI will use the information obtained during this task to support environmental regulatory permitting efforts for the waste feed evaporator and further to provide the operating data and correlations for the RPP-WTP flowsheet model. The overall scope of this task was described in the WTP R&T Test Scoping Statement S89.

This report completes the activities of the Task Technical and Quality Assurance Plan for Waste Feed Evaporator Off-Gas Emissions Modeling (WSRC-TR-2002-00262). The WSRC Quality Assurance Program was followed, which has been approved by WTP, and the WSRC Quality Assurance Management Plan (WSRC-RP-92-225). This program will apply the appropriate quality assurance requirements for this task from NQA-1-1989, and NQA-2a-1990, Part 2.7, as indicated by the QA plan (WSRC-TR-2002-00262).

1.0 SUMMARY OF OFFGAS MODELING

A task and quality assurance plan was developed and carried out to produce modeling data in support of the regulatory offgas permitting. The tasks involved to produce this offgas data consisted of the following:

1.1 Determine baseline untreated waste feed and recycle compositions

The RPP-WTP pretreatment has undergone several major flowsheet changes recently, which include bypassing of the waste feed evaporator altogether when the sodium content of untreated waste feeds is greater than 5 molar. The baseline waste feed and SBS recycle stream data was provided by Alex Choi from analytical data for the representative Envelope B/D samples[2,3], whose TOC levels are lower than those of Envelope C. The waste feed rate was set to produce 30 Mton/day of 17 wt% Na_2O glass. The TOC level of the baseline feed was increased to the Envelope C levels to bound the air emission projections. The baseline feed was also spiked with both soluble and insoluble mercury. The un-spiked baseline feed compositions are shown in Table I. The organic spike amounts are shown in the next section. The mercury spike for the waste feed is shown in Table II. The insoluble mercury was represented by mercuric oxide (HgO) and the soluble mercury was represented by mercuric chloride ($HgCl_2$). These forms were chosen based on their solubility behavior in the OLI modeling software. To determine the amount of mercury to spike in the waste feed, all insoluble and soluble mercury levels in the tank farm were reviewed based on TFCOUP data[3].

[7] ESP Software, http://www.olisystems.com/, OLI Systems, Inc., Morris Plains, NJ (2002).

Table III shows the results of the tank survey. Tank AZ-102 had the highest soluble Hg content with respect to the total soluble solids in each tank. Tank AY-102 had the highest insoluble Hg content with respect to the total insoluble solids in each tank. These tank levels were used in conjunction with contract limits on the amount of mercury to be processed to derive the mercury spikes for the waste feed. The contract limit for insoluble mercury is 0.1g Hg per 100 g nonvolatile oxide and the assumed total gram equivalents of non-volatile oxide per liter of HLW sludge is 31. Combining these two values gives a 0.03 g insoluble Hg per liter of waste feed. The volume of the waste feed was 3560 liter per hour. These two values gave the amount of insoluble mercury in the feed. The total insoluble solids in the feed were then calculated based on the amount of insoluble mercury in the feed and the Tank AY-102 insoluble mercury ratio. The contract limit for soluble mercury was 1.4e-5 gmole soluble Hg per gmole Na from Appendix A of the TFCOUP document[3]. Using this contract limit gives a soluble Hg to total soluble solids ratio of 3.08e-5 in the waste feed compared to the Tank AZ-102 value of 3.83e-7. To be conservative the higher contract limit value was used to set the amount of soluble mercury in the feed. If this assumption is not valid then a different amount of soluble mercury should be assumed. The actual mercury feed amounts shown in Table II were derived from these mercury tank values and contract limits.

Table I. Baseline Feed

Real Name	OLI Name	GMOLES
Water	H2O	1.880E+05
Sodium Nitrite	NANO2	2.906E+03
Sodium Nitrate	NANO3	6.503E+02
Sodium Hydroxide	NAOH	3.921E+02
Sodium Sulfate	NA2SO4	5.872E+02
Sodium Oxalate	NA2C2O4	1.122E+02
Sodium Aluminate	NAALO2	9.740E+01
Sodium Fluoride	NAF	1.776E+02
Sodium Chloride	NACL	1.792E+01
Sodium Carbonate	NA2CO3	1.783E+03
Sodium Phosphate	NA3PO4	9.005E+00
Sodium Chromate (VI)	NA2CRO4	5.155E+01
Potassium Nitrate	KNO3	2.812E+02
Sodium Formate	NACOOH	8.605E+00
2,2-Iminobisacetic acid	H2IDA	8.507E+00
Sodium Acetate	NAACET	3.264E+00
Sodium Dihydrogen Citrate	NAH2CTRT	9.214E+00
Sodium Glycolate	NAGLYCOLAT	4.648E+01
Disodium Dihydrogen EDTA	NA2H2EDTA	5.506E+00
Calcium Nitrate	CANO32	9.404E+00
Cesium Nitrate	CSNO3	1.027E+00

Table II. Mercury Spike for Baseline Feed[8]

Real Name	OLI Name	GMOLES
Mecuric Chloride (sol)	HGCL2	9.600E-02
Mercuric Oxide (insol)	HGO	5.320E-01

[8] This work does not reflect the true conditions of mercury in the waste feed evaporator. For this reason it is strongly suggested that the mercury calculations not be used in the evaporator engineering calculations for design.

Table III. Mercury Spike Basis[8]

Highest Soluble Hg Concentration		Highest Insoluble Hg Concentration	
Tank AZ-102		Tank AY-102	
Tank Soluble Hg/ Total Soluble Solids	3.83e-7	Tank Insoluble Hg/ Total Insoluble Solids	6.28e-4
Model Soluble Hg/ Total Soluble Solids	3.08e-5*	Model Insoluble Hg/ Total Insoluble Solids	6.29e-4

*Higher than tank value due to 1.4e-5 gmol sol Hg/gmol Na contract limit

Due to the basic nature of the waste feed, the insoluble mercury and soluble mercury feed input values shown in Table II change when OLI calculates equilibrium. The primary OLI equilibrium equations for mercury for this model were:

$HgO + H2O \leftrightarrow Hg^{2+} + 2OH^-$
$HgCl_2 \leftrightarrow Hg^{2+} + 2Cl^-$
$Hg(OH)_2 \leftrightarrow Hg^{2+} + 2OH^-$
$Hg(OH)_3^- \leftrightarrow Hg^{2+} + 3OH^-$

The OLI mercury equilibrium for the waste feed is shown in Table IV. Forty percent of the mercuric oxide stays in its input form while the remaining 60% converts to mercuric hydroxide ($Hg(OH)_2$) and mercury trihydroxide ion ($Hg(OH)_3^{-1}$). Note that all mercury species have a valence of 2. At equilibrium, the mercuric oxide form is insoluble and the hydroxide forms are soluble. In this sense, a portion of the feed mercuric oxide is soluble and another portion is insoluble. The mercuric chloride in the feed input is converted to mercuric hydroxide ($Hg(OH)_2$) and mercury trihydroxide ion ($Hg(OH)_3^{-1}$) on equilibrium. Therefore OLI feed input values are not necessarily fixed as OLI will perform an equilibrium calculation for all species in the feed stream before any calculations start. In this sense the soluble mercury in the waste feed is represented by its proper mercuric forms ($Hg(OH)_2$ and $Hg(OH)_3^{-1}$).

Table IV. OLI Mercury Equilibrium for Feed[8]

HG Compound	Waste Feed Input [mole/hr]	Waste Feed OLI Equil. [mole/hr]
HgO (insoluble)	0.532	0.213
$HgCl_2$ (soluble)	0.096	0
$Hg(OH)_2$ (soluble)	0	0.399
$Hg(OH)_3^{-1}$ (soluble)	0	0.016

To represent mercury redox in the model a mercury redox reaction was added to the OLI model chemistry. The redox reaction used was:

$$\mathbf{NO_2^- + Hg^{+2} + 2OH^- = Hg + NO_3^- + H_2O}$$

This redox reaction was based on prior experience with mercury redox in nitric acid feeds of evaporators at DWPF. The redox reaction was expressed as the following rate expression:

rate=0.67*HgO

where rate is in gmole/hr and HgO is in gmole/hr. This specific rate expression was chosen after trying several forms of the rate expression. Theoretically the redox rate could be expressed as:

$$\mathbf{rate = 0.5 * Hg^{+2} * H_2O / 55.508}$$

where Hg^{+2} is in gmole/kg water and H_2O is in gmole/hr to give the rate units of gmole/hr. However, after several trial runs, the rate expression in terms of the input species HgO gave the most predictable results. The 0.67 rate constant was chosen to give an assumed 50% reduction of HgO to Hg in the feed. This redox

rate was purely arbitrary and was chosen to examine OLI's response for a non-zero redox behavior. The redox rate can be changed to better represent the RPP feed conditions.

OLI will perform the mercury redox defined above followed by its standard equilibrium calculations. This results in a reaction pathway like:

$$HgO \rightarrow Hg \leftrightarrows Hg(OH)_2 + Hg(OH)_3^-$$

Following the reaction pathway shown above, the OLI model streams with mercury (waste feed and total recycle) have the compositional makeup shown in Table V. The mercuric oxide in the feed is reduced first to elemental mercury (Hg) according to the user specified redox rate. Any remaining mercuric oxide then equilibrates to mercuric hydroxide and mercury trihydroxide ion. The elemental mercury formed from reduction also equilibrates with mercuric hydroxide and mercury trihydroxide ion. This equilibration is why the amount of elemental mercury is less than the rate expression predicts. Since the mercury redox rate was arbitrarily set at 50%, it could be set to 0% which would mean no elemental mercury would appear in the waste or recycle streams. Indirectly this redox specification affects the mercury partitioning in the offgas system since all elemental mercury in the OLI feed will go out the evaporator overhead. Only about 5% of the mercuric chloride in the evaporator feed will go out the overhead with 95% going out the bottoms. No other forms of mercury are predicted in the evaporator overhead stream. All forms of mercuric oxide (mercuric hydroxide and mercury trihydroxide ion) in the OLI feed will go out the evaporator bottoms. If there is concern for mercury in the offgas system then the amount of elemental mercury in the feed as well as any potential reduction of insoluble mercury in the feed should be carefully monitored and controlled.

Table V. Equilibrium Input and Reduced Feeds with Mercury at 25°C, 1 atm[8]

HG Compound	Total Recycle OLI Equil. [mole/hr]	Waste Feed OLI Equil. [mole/hr]	Waste Feed + Total Recycle Reduced OLI Equil. [mole/hr]
HgO (insoluble)	0	0.213	0
$HgCl_2$ (soluble)	0	0	0
$Hg(OH)_2$ (soluble)	0.004	0.399	0.312
$Hg(OH)_3^{-1}$ (soluble)	0	0.016	0.004
Hg (vapor)	0	0	0.316

Secondary-waste recycle streams also make up part of the feed to the waste feed evaporator system. The major recycle streams are the HLW melter submerged bed scrubber (SBS) condensate (also referred to as the HLW Offgas Condensate stream), ultrafiltration (UF) solids wash permeate and acidic/caustic cleaning solutions, ion-exchange resin wash effluents, and evaporator condensate[9]. The feed evaporator process (FEP) flowsheet including the UF and recycle blending was modeled in another task and a description of the FEP flowsheet is given in the test plan for that task[1]. The recycle and waste feed blends and flow rates of the prior task were used in this task. The FEP OLI model of the prior task was expanded to include the primary off-gas system for this work. The selection of the recycle composition and blending ratio for the two offgas test cases came out of the prior FEP flowsheet task[1].

The two regulatory offgas test cases set the density of the post-UF clarified feed to the cesium ion-exchange operation to the design basis of 1.22 g/ml and the out-of-design point of 1.35 g/ml.[10] Each density

[9] Bergman, L. M., E. Berrios, E. Bixel, D. Dearlove, R. Gimpel, C. Knauss, A. Olander, A. Pajunen, J. Reynolds, and D. Harty, "WTP Material Balances and Process Flowsheet Bases, Requirements, and Results," 24590-WTP-RPT-ENG-01-004, Rev. 0, Washington Group International, Richland, WA, January, 2002.

[10] Nowak, R., "System Description for Waste Feed Evaporation Process (FEP)," 24590-PTF-3YD-FEP-00001, Rev. B, Bechtel National, Inc., Richland, WA, May 1, 2002.

point was achieved by changing the concentration or boilup in the evaporator. This boil-up in turn affected the organic partitioning.

1.2 Determine target organic constituents

Fourteen target organic compounds were spiked into the AN-107 simulant during a recent treated feed evaporator regulatory study by Hiroshi Saito[11]. These organic compounds were selected to represent volatile, semi-volatile, and pesticide contaminants present in the Hanford wastes. The volatile. semi-volatile, and pesticide groups were defined in the Hiroshi study. The distinction between the groupings is based primarily on boiling points of the various components. The fourteen organics in the Hiroshi study were included in this study along with six additional organics shown in Table VI (the additional organics are **bolded** and *italicized)*. All twenty target organic compounds listed in Table VI were spiked into the baseline Envelope B/D waste feed at 1 PPM each. The gmole amounts equivalent to 1 PPM are shown in Table VI. The 1 PPM amounts are based on a total mass including soluble and insoluble solids in the waste feed. The total soluble solids were made up of the baseline feed components minus the water plus the soluble portion of mercury. The total insoluble solids was based on the ratio of insoluble mercury to total insoluble solids in tank AY-102 (the highest mercury value). Using the total soluble and insoluble solids plus water weight, the organic masses were targeted at 1e-6 mass fraction from which the molar amounts were calculated.

Table VI. Target Organic Compounds Spiked into Envelope B/D Feed

	Target Organic	OLI Name	Formula	Boiling Pt. °C	M.W.	Spike gmoles
Volatile	Benzene	BENZENE	C6H6	80.1	78.11	0.053707
	4-methyl-2-pentanone (MIBK)	M4PNTON2	C6H12O	116.5	100.16	0.041885
	Toluene	TOLUENE	C7H8	110.6	92.14	0.045531
	1,2-dibromoethane	DBRE12	C2H4Br2	131.4	28.05	0.149542
	Chlorobenzene	CLBENZEN	C6H5Cl	131.7	112.56	0.037272
	1,2,3-trichloropropane	TCLPRP123	C3H5Cl3	156.9	147.43	0.028456
	phenol	C6H5OH	C6H5OH	181.8	94.11	0.044577
	Hexachlorobutadiene	HXCL13BD	C4Cl6	215.0	260.76	0.016089
Semi-volatile	1,2,4-trichlorobenzene	TCLBNZ124	C6H3Cl3	213.0	181.45	0.023121
	Naphthalene	NAPHTHALEN	C10H8	218.0	128.18	0.032731
	Hexachlorobenzene	CL6BENZEN	C6Cl6	325.0	284.78	0.014731
	Pentachlorophenol	CL5PHENOL	C6Cl5OH	309.4	266.34	0.015752
	Pyrene	PYRENE	C16H10	393.0	202.26	0.020742
	Bis(ethylhexyl)phthalate (BEHP)	BETHXPHTH2	C24H38O4	384.0	390.57	0.010741
	Benzo(a)pyrene	BNZPYREN	C20H12	311.0	252.32	0.016627
	2-Chloronaphthalene	CLNAPHTH2	C10H7Cl	259.0	162.62	0.025798
	Dibenz[a,h]anthracene	DBANTHAH	C22H14	524.0	278.36	0.015072
	Diethyl phthalate	DIETPHTHL	C12H14O4	294.0	222.24	0.018877
Pesticide	Aldrin	ALDRINE	C12H8Cl6	440.0	364.92	0.011497
	gamma-BHC (Lindane)	LINDANE	C6H6Cl6	323.4	290.83	0.014425

1.3 Expand the existing evaporator model to include the evaporator off-gas system

The existing waste feed evaporator OLI model used in the earlier regulatory studies[11] was expanded to include the off-gas system beyond the primary condenser and to include the ultrafiltration-caustic washing recycles after the evaporator. The off-gas system components included in the expanded OLI model were the steam ejectors, pressure control air valve, intercondenser, aftercondenser, condensate vessel, and demister. Some of the key features for each off-gas component are given next[10]. The expanded waste feed evaporator is described in detail in Appendix B.

Two steam ejectors are used to pull a necessary vacuum so that the liquid in the separator vessel (FEP-SEP-0001 A/B) will boil at 50 ^{o}C. Both ejectors use superheated steam provided at a pressure of 109 psig and a temperature of 173 ^{o}C. Each steam ejector was modeled as a simple, adiabatic MIX node. The steam ejectors steam flow was determined from generic ejector performance curves with a Discharge/Suction Pressure compression ratio of 3 and an optimum area ratio of 50. Using a generic ejector performance curve from Perry's 5th p. 6-29, the entrainment at 90% efficiency was 0.5 lb suction vapor /lb steam. To match the given suction gas flow, 100 lb/hr of superheated steam was chosen. Actually less steam (about 80 lb/hr) would be needed ideally but the larger amount was chosen since the actual ejector performance curve will not be as idealized.

Both the intercondenser and aftercondenser for the first and second steam ejectors were assumed to operate at 40 ^{o}C. Each condenser was modeled in OLI as a simple, vapor-liquid equilibrium separator operating at a constant temperature. A nominal 5% of operating pressure was used to represent the pressure drop in the condensers as suggested in vendor literature as well as other offgas equipment. It is assumed that the off-gas exiting a condenser is saturated.

A demister (FEP-DMST-00001 A/B) removes entrained aerosols from the aftercondenser offgas vent. The concentrations of target organics remaining in the discharge vent from this demister represent the air emission into the Process Vessel Vent System (PVVS). The demister was modeled in OLI as an adiabatic separator with 99% removal efficiency. This removal efficiency is based on SRS experience. The value can be changed to reflect vendor specifications. This removal efficiency was represented by a 0.01 g liquid/g vapor entrainment ratio in the OLI separator vessel.

The condensate produced in the primary condenser (FEP-COND-00001 A/B), intercondenser (FEP-COND-00002 A/B), and aftercondenser (FEP-COND-00003 A/B) is all gravity drained to the waste feed evaporator condensate vessel (FEP-VSL-00005). The condensate vessel was modeled in OLI as an isothermal MIX tank with a controlled air purge. A design basis air inleakage rate was used.

Control air for the vacuum system enters just upstream of the first steam ejector right after the primary condenser. The motive steam flow to each ejector was fixed at 100 lb/hr based on generic ejector curves and the suction gas flow entering the ejector. The control air flow was set at 2 times the estimated amount of air inleakage. In addition the control air was assumed to be 25% saturated. As a result, saturated off-gas exiting the primary condenser will become under saturated at the inlet of the first steam ejector. Since the waste feed evaporator OLI model describes a steady state operation only, there is no need to model controller actions and/or valve dynamics associated with the modulation of control air flow. An adiabatic MIX block was added to mix the primary condenser vent flow with the control air flow.

1.4 Calculate partitioning of target organic compounds

The expanded waste feed evaporator OLI model was run to predict how the target organic compounds partitioned among the vapor and liquid discharge streams of the offgas system. The model was run under the two conditions of normal operation of 1.22 g/ml and abnormal operation of 1.35 g/ml for the ultrafiltration filtrate stream (UF1 Filtrate). Figure 1 shows the mass balance of the waste feed evaporator offgas run for the ultrafiltrate density of 1.22 g/ml. Table VII shows the organic feed flows of the evaporator waste feed and recycle streams for the ultrafiltrate density of 1.22. Table VIII shows the

partitioning of the feed organics for the ultrafiltrate density of 1.22 g/ml. Figure 2 shows the mass balance of the waste feed evaporator offgas run for the ultrafiltrate density of 1.35 g/ml. Table IX shows the organic feed flows of the evaporator waste feed and recycle streams for the ultrafiltrate density of 1.35 g/ml. Table X shows the partitioning of the feed organics for the ultrafiltrate density of 1.35 g/ml. One page summary schematics of these two offgas run results are shown in Appendix A. Also in Appendix A are complete run outputs for all species in the OLI model.

1.5 Validate predicted partitioning of target organics against pilot data

A pilot evaporator will be built and then the OLI model results will be compared to the measured data. Of primary importance to model validation are the samples of separator vessel liquid, primary condenser liquid, primary condenser vent, demister vent, and condensate vessel liquid. Some of these liquids may or may not be available for analysis.

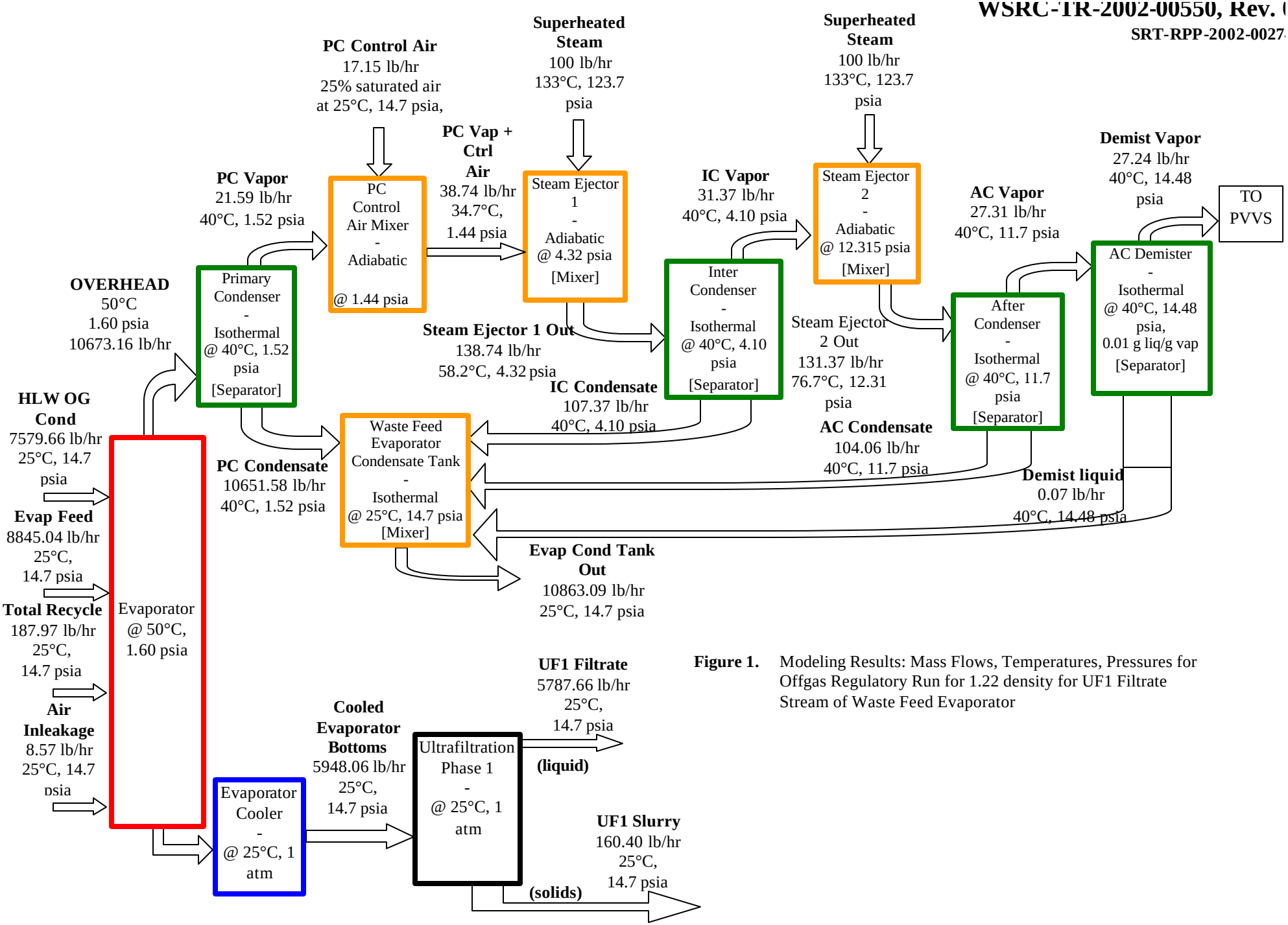


Figure 1. Modeling Results: Mass Flows, Temperatures, Pressures for Offgas Regulatory Run for 1.22 density for UF1 Filtrate Stream of Waste Feed Evaporator

Table VII. Organic Feed Flows for Offgas Regulatory Modeling Run UF1 Filtrate 1.22 density[8]

Stream	Total Recycle	Evap Feed
Phase	Mixed	Mixed
Temperature, C	25	25
Pressure, atm	1	1
pH	13.4748	13.0705
Total mol/hr	4402.02	197463
Mass Flow Units	g/hr	g/hr
Aldrin	1.568E-04	4.195E+00
Benzene	7.739E-07	4.194E+00
Bis(2-ethylhexyl)phthalate (BEHP)	1.971E-03	4.193E+00
Benzo(a)pyrene (BaP)	9.236E-06	4.181E+00
Phenol	2.747E-02	4.196E+00
Pentachlorophenol	2.372E-03	4.196E+00
Hexachlorobenzene	2.205E-05	4.188E+00
Chlorobenzene	1.660E-06	4.190E+00
2-Chloronaphthalene	4.459E-06	4.194E+00
Dibenz[a,h]anthracene	1.102E-03	4.191E+00
1,2-dibromoethane	3.989E-05	2.806E+01
Diethyl phthalate	5.992E-03	4.202E+00
Mercury Chloride	0.000E+00	0.000E+00
Mercury (sol)	3.801E-06	0.000E+00
Mercuric Oxide (insol)	9.851E-01	1.361E+02
Hexachlorobutadiene	3.470E-08	4.200E+00
gamma-BHC (Lindane)	9.689E-05	4.209E+00
4-methyl-2-pentanone (MIBK)	1.850E-05	4.197E+00
Naphthalene	4.906E-06	4.188E+00
Pyrene	1.524E-04	4.202E+00
1,2,4-trichlorobenzene	1.035E-06	4.193E+00
1,2,3-trichloropropane	7.301E-06	4.198E+00
Toluene	6.433E-07	4.194E+00
Total g/hr	85260.4	4.01E+06
Volume, L/hr	79.456	3550.76
Enthalpy, cal/hr	-3.07E+08	-1.40E+10
Vapor fraction		
Solid fraction	2.78E-04	2.24E-04
Organic fraction	9.59E-10	4.89E-07
Osmotic Pres, atm	60.765	90.7109
Redox Pot, volts		
E-Con, 1/ohm-cm	0.123482	0.137767
E-Con, cm2/ohm-mol	48.9223	68.3032
Abs Visc, cP	1.15	1.49431
Rel Visc	1.29109	1.67765
Ionic Strength	1.59552	3.06198

Table VIII. Organic Partitioning In Terms Of Waste Feed and Recycle Streams for Offgas Regulatory Modeling Run UF1 Filtrate 1.22 Density[8]

Stream	Overhead	Cooled Evap Bott	UF1 Filtrate	UF1 Slurry	PC Vapor	PC Condensate	IC Vapor	IC Condensate	AC Vapor	AC Condensate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Aldrin	85.66%	14.34%	14.03%	0.31%	0.22%	85.44%	0.07%	0.15%	0.01%	0.06%	0.01%	0.00%	85.65%
Benzene	100.00%	0.00%	0.00%	0.00%	90.23%	9.76%	90.01%	0.22%	89.26%	0.75%	89.26%	0.00%	10.74%
Bis(2-ethylhexyl)phthalate (BEHP)	42.70%	57.30%	56.06%	1.24%	0.01%	42.69%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	42.70%
Benzo(a)pyrene (BaP)	0.00%	100.00%	0.05%	99.95%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Phenol	0.15%	99.85%	97.68%	2.17%	0.00%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%
Pentachlorophenol	90.84%	9.16%	8.97%	0.20%	0.14%	90.69%	0.01%	0.14%	0.00%	0.01%	0.00%	0.00%	90.83%
Hexachlorobenzene	0.00%	100.00%	0.11%	99.89%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chlorobenzene	99.99%	0.01%	0.01%	0.00%	82.59%	17.40%	82.19%	0.40%	80.87%	1.32%	80.87%	0.00%	19.13%
2-Chloronaphthalene	99.98%	0.02%	0.02%	0.00%	50.84%	49.14%	49.76%	1.08%	46.38%	3.39%	46.37%	0.01%	53.61%
Dibenz[a,h]anthracene	0.22%	99.78%	97.61%	2.16%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%
1,2-dibromoethane	99.98%	0.02%	0.02%	0.00%	53.16%	46.82%	52.10%	1.06%	48.76%	3.34%	48.76%	0.00%	51.22%
Diethyl phthalate	78.05%	21.94%	21.47%	0.48%	0.04%	78.02%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	78.06%
Mercury Chloride	4.60%	96.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mercury (sol)	100.00%	0.00%	0.00%	0.00%	12.26%	87.73%	5.37%	6.90%	1.53%	3.84%	1.22%	0.32%	98.78%
Mercuric Oxide (insol)	0.00%	100.00%	56.91%	43.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hexachlorobutadiene	100.00%	0.00%	0.00%	0.00%	99.28%	0.72%	99.27%	0.01%	99.23%	0.04%	99.23%	0.00%	0.77%
gamma-BHC (Lindane)	99.56%	0.44%	0.43%	0.01%	5.93%	93.64%	4.43%	1.49%	2.08%	2.35%	2.08%	0.00%	97.49%
4-methyl-2-pentanone (MIBK)	99.93%	0.07%	0.07%	0.00%	23.37%	76.56%	21.73%	1.64%	17.33%	4.41%	17.32%	0.00%	82.61%
Naphthalene	99.98%	0.02%	0.02%	0.00%	60.12%	39.86%	59.22%	0.90%	56.35%	2.87%	56.34%	0.00%	43.64%
Pyrene	96.12%	3.88%	3.79%	0.08%	1.06%	95.06%	0.56%	0.50%	0.14%	0.43%	0.13%	0.01%	96.00%
1,2,4-trichlorobenzene	100.00%	0.00%	0.00%	0.00%	83.04%	16.96%	82.66%	0.38%	81.40%	1.26%	81.40%	0.00%	18.60%
1,2,3-trichloropropane	99.97%	0.03%	0.03%	0.00%	44.56%	55.42%	43.32%	1.24%	39.51%	3.81%	39.51%	0.00%	60.47%
Toluene	100.00%	0.00%	0.00%	0.00%	91.37%	8.63%	91.17%	0.20%	90.50%	0.66%	90.50%	0.00%	9.49%

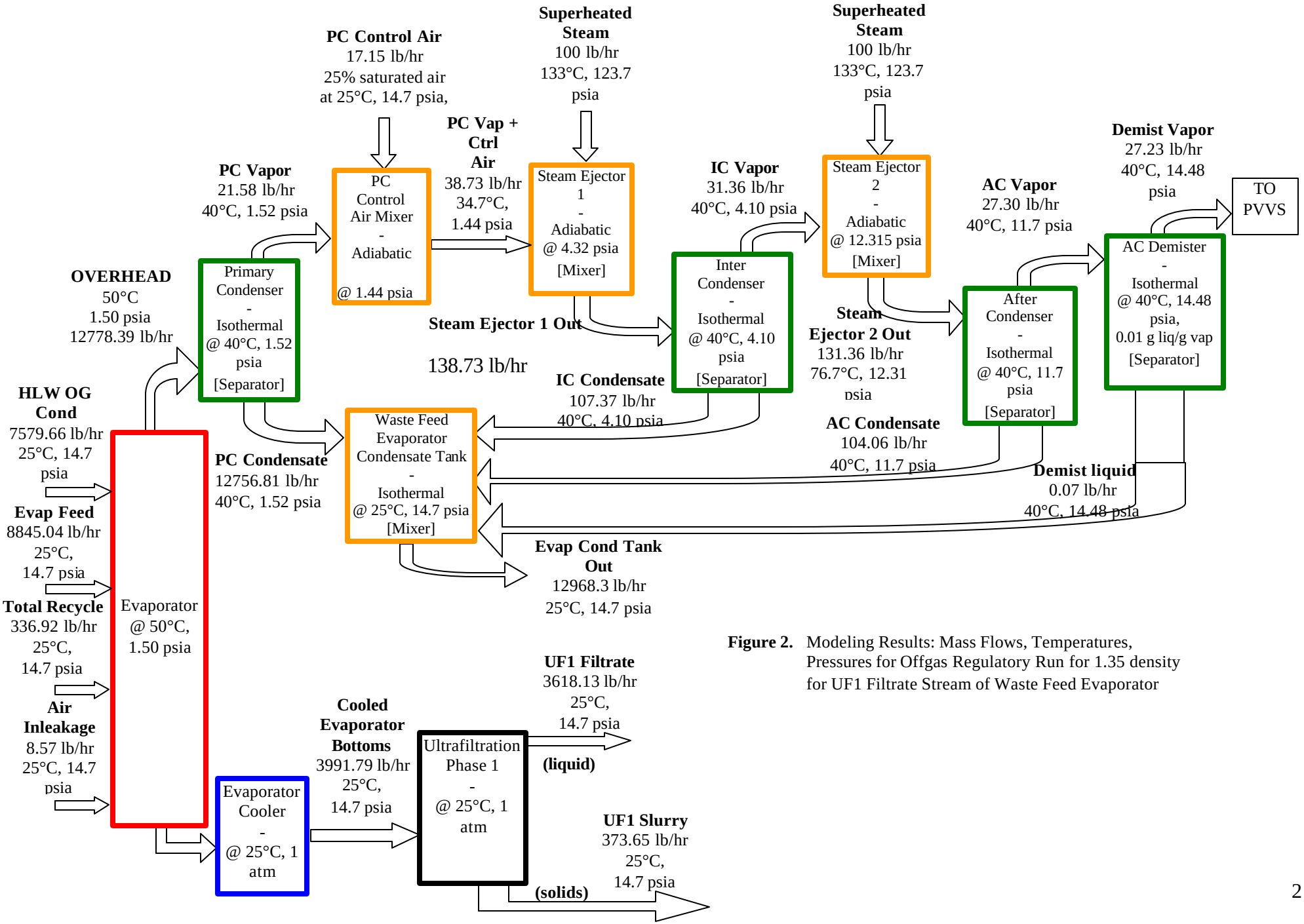


Figure 2. Modeling Results: Mass Flows, Temperatures, Pressures for Offgas Regulatory Run for 1.35 density for UF1 Filtrate Stream of Waste Feed Evaporator

Table IX. Organic Feed Flows for Offgas Regulatory Modeling Run UF1 Filtrate 1.35 density[8]

Stream	Total Recycle	Evap Feed
Phase	Mixed	Mixed
Temperature, C	25	25
Pressure, atm	1	1
pH	12.8607	13.0705
Total mol/hr	7912.79	197463
Flow Units	g/hr	g/hr
Aldrin	7.204E-05	4.195E+00
Benzene	3.537E-07	4.194E+00
Bis(2-ethylhexyl)phthalate (BEHP)	9.539E-04	4.193E+00
Benzo(a)pyrene (BaP)	6.746E-06	4.181E+00
Phenol	5.364E-02	4.196E+00
Pentachlorophenol	1.161E-03	4.196E+00
Hexachlorobenzene	1.610E-05	4.188E+00
Chlorobenzene	7.586E-07	4.190E+00
2-Chloronaphthalene	2.038E-06	4.194E+00
Dibenz[a,h]anthracene	5.199E-04	4.191E+00
1,2-dibromoethane	1.823E-05	2.806E+01
Diethyl phthalate	3.287E-03	4.202E+00
Mercury Chloride		
Mercury (sol)	1.744E-06	
Mercuric Oxide (insol)	1.534E+00	1.361E+02
Hexachlorobutadiene	1.590E-08	4.200E+00
gamma-BHC (Lindane)	4.442E-05	4.209E+00
4-methyl-2-pentanone (MIBK)	8.460E-06	4.197E+00
Naphthalene	2.243E-06	4.188E+00
Pyrene	6.996E-05	4.202E+00
1,2,4-trichlorobenzene	4.735E-07	4.193E+00
1,2,3-trichloropropane	3.338E-06	4.198E+00
Toluene	2.940E-07	4.194E+00
Total g/hr	152823	4.01E+06
Volume, L/hr	143.624	3550.76
Enthalpy, cal/hr	-5.51E+08	-1.40E+10
Vapor fraction		
Solid fraction	1.71E-04	2.24E-04
Organic fraction	2.21E-10	4.89E-07
Osmotic Pres, atm	48.2193	90.7109
Redox Pot, volts		
E-Con, 1/ohm-cm	0.0918338	0.137767
E-Con, cm2/ohm-mol	43.1466	68.3032
Abs Visc, cP	1.06321	1.49431
Rel Visc	1.19366	1.67765
Ionic Strength	1.37611	3.06198

Table X. Organic Partitioning In Terms Of Waste Feed and Recycle Streams for Offgas Regulatory Modeling Run UF1 Filtrate 1.35 Density[8]

Stream	Overhead	Cooled Evap Bott	UF1 Filtrate	UF1 Slurry	PC Vapor	PC Condensate	IC Vapor	IC Condensate	AC Vapor	AC Condensate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Aldrin	89.58%	10.42%	9.63%	0.80%	0.22%	89.36%	0.08%	0.14%	0.01%	0.07%	0.01%	0.00%	89.57%
Benzene	100.00%	0.00%	0.00%	0.00%	88.52%	11.47%	88.30%	0.22%	87.57%	0.74%	87.57%	0.00%	12.43%
Bis(2-ethylhexyl)phthalate (BEHP)	53.47%	46.53%	42.98%	3.55%	0.01%	53.46%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	53.47%
Benzo(a)pyrene (BaP)	0.00%	100.00%	0.01%	99.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Phenol	0.11%	99.89%	92.27%	7.62%	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%
Pentachlorophenol	97.37%	2.62%	2.42%	0.20%	0.13%	97.24%	0.01%	0.12%	0.00%	0.01%	0.00%	0.00%	97.37%
Hexachlorobenzene	0.00%	100.00%	0.03%	99.97%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chlorobenzene	100.00%	0.00%	0.00%	0.00%	79.84%	20.16%	79.46%	0.38%	78.18%	1.28%	78.18%	0.00%	21.82%
2-Chloronaphthalene	99.99%	0.01%	0.01%	0.00%	46.50%	53.49%	45.52%	0.98%	42.43%	3.09%	42.42%	0.00%	57.57%
Dibenz[a,h]anthracene	0.30%	99.70%	92.09%	7.61%	0.00%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.30%
1,2-dibromoethane	100.00%	0.01%	0.00%	0.00%	48.65%	51.34%	47.69%	0.97%	44.63%	3.06%	44.63%	0.00%	55.36%
Diethyl phthalate	93.72%	6.28%	5.80%	0.48%	0.04%	93.69%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	93.72%
Mercury Chloride	4.60%	96.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mercury (sol)	100.00%	0.00%	0.00%	0.00%	12.21%	87.79%	5.35%	6.87%	1.53%	3.82%	1.21%	0.32%	98.79%
Mercuric Oxide (insol)	0.00%	100.00%	26.08%	73.92%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hexachlorobutadiene	100.00%	0.00%	0.00%	0.00%	99.17%	0.83%	99.16%	0.01%	99.12%	0.04%	99.12%	0.00%	0.88%
gamma-BHC (Lindane)	99.85%	0.15%	0.14%	0.01%	5.08%	94.77%	3.81%	1.28%	1.79%	2.02%	1.78%	0.00%	98.07%
4-methyl-2-pentanone (MIBK)	99.98%	0.02%	0.01%	0.00%	20.30%	79.68%	18.88%	1.42%	15.05%	3.83%	15.05%	0.00%	84.94%
Naphthalene	100.00%	0.00%	0.00%	0.00%	55.77%	44.23%	54.94%	0.83%	52.27%	2.67%	52.27%	0.00%	47.73%
Pyrene	97.35%	2.65%	2.45%	0.20%	1.03%	96.31%	0.56%	0.47%	0.14%	0.42%	0.13%	0.01%	97.21%
1,2,4-trichlorobenzene	100.00%	0.00%	0.00%	0.00%	80.43%	19.57%	80.06%	0.37%	78.85%	1.22%	78.84%	0.00%	21.16%
1,2,3-trichloropropane	99.99%	0.01%	0.01%	0.00%	40.16%	59.83%	39.05%	1.12%	35.61%	3.43%	35.61%	0.00%	64.39%
Toluene	100.00%	0.00%	0.00%	0.00%	89.83%	10.17%	89.64%	0.19%	88.99%	0.65%	88.99%	0.00%	11.01%

2.0 DISCUSSION OF RESULTS

The source of organics in the waste feed evaporator offgas OLI model are the waste feed and total recycle streams from the caustic washing and leaching ultrafiltration steps. In order to get the total recycle stream composition and flow rate, a five stage waste feed evaporator OLI model was used. This 5-stage waste feed evaporator OLI model is described in detail in Appendix A. The resulting total recycle stream composition and the waste feed composition for the nominal offgas case with ultrafiltrate density of 1.22 is shown in Table XII and the abnormal case with ultrafiltrate density of 1.35 is shown in Table XIII. Also in these tables are the organic and mercury partitioning of each offgas stream in relation to the total input of organics in the waste feed and total recycle streams.

The normal 1.22 g/ml ultrafiltrate density case differs from the abnormal 1.35 g/ml density case primarily in the amount of water being evaporated. In the abnormal case 20% more water is evaporated into the evaporator overhead to meet the higher density requirement for the ultrafiltrate stream. This higher boil-off rate in turn impacts the organic partitioning. For the volatiles (Benzene, 4-methyl-2-pentanone (MIBK), Toluene, 1,2-dibromoethane, Chlorobenzene, 1,2,3-trichloropropane, Phenol, Hexachlorobutadiene), the percent with respect to the total evaporator feed (including recycles) going into the evaporator overhead for the normal and abnormal case are about the same. For the semi-volatiles (1,2,4-trichlorobenzene, Naphthalene, Hexachlorobenzene, Pentachlorophenol, Pyrene, Bis(ethylhexyl)phthalate (BEHP), Benzo(a)pyrene, 2-Chloronaphthalene, Dibenz[a,h]anthracene, Diethyl phthalate), the Pentachlorophenol, Bis(2-ethylhexyl)phthalate (BEHP), and Diethyl phthalate for the abnormal case show 7%, 11%, and 16% more of these components with respect to the total evaporator feed (including recycles) going out the evaporator overhead than the normal case. As a result, 7%, 11%, and 16% less of these components end up in the cooled evaporator bottoms and 7%, 11%, and 16% more of the components end up in the primary condenser condensate. The pesticides (Aldrin, gamma-BHC (Lindane)) behave basically the same for the normal and abnormal cases. Based on these OLI results some of semi-volatile components (Pentachlorophenol, Bis(2-ethylhexyl)phthalate (BEHP), and Diethyl phthalate) are more susceptible to the amount of water being boiled off in the evaporator. Other than these specific semi-volatiles, the organic partitioning remains about the same or within 5% between the two cases.

The compounds phenol, hexachlorobenzene, and benzo(a)pyrene despite their classification as volatile or semi-volatile come out the cooled evaporator bottoms. This result is because OLI predicts a high solubility of each of these compounds in water. This solubility inhibits the carry over of these compounds in the evaporator overhead stream. This behavior has been observed in earlier OLI runs and experiments[4].

This work does not reflect the true conditions of mercury in the waste feed evaporator. For this reason it is strongly suggested that the mercury calculations not be used in the evaporator engineering calculations for design. SRTC will be conducting experiments to attempt to provide a mercury mass balance across the waste feed evaporator.[6] This new work will be better suited for mercury analysis and engineering design calculations.

The mercury partitioning based on the information available was straightforward in the OLI modeling. Whatever elemental mercury enters the evaporator goes out the overhead. About 5% of the mercuric chloride in the evaporator feed goes out the evaporator overhead. No other mercury species were observed in the evaporator overhead. Any insoluble mercury entering the evaporator goes out the bottoms. The mercury redox only defines how much of the insoluble mercury entering the evaporator is converted to elemental mercury. The assumption of 50% reduction of mercuric oxide to mercury was purely arbitrary to show the effects of redox on the system. If a 0% mercury reduction is assumed then none of the insoluble mercury in the feed is reduced. The amount of elemental mercury in the feed may be higher than true values. Regardless of the amount present, any elemental mercury in the feed is predicted by OLI to go out the top of the evaporator. SRTC is planning some experiments to verify the partitioning of mercury in an evaporator setup versus OLI predictions. Only about 0.8% of the total mercury in the waste feed returns through the total recycle stream as soluble mercury (mercuric hydroxide and hydroxide ion) from the

ultrafiltration/caustic washing/leaching step to the evaporator. There were no odd mercury compounds that OLI predicted forming.

The current offgas OLI modeling was compared with the prior work of Hiroshi[11] as an internal check. In order to make this comparison, certain model streams from Hiroshi's work had to be equated with the new offgas model streams: Hiroshi's primary condenser condensate equates to the new primary condenser condensate, Hirohsi's cooled evaporator bottoms equates to the new evaporator cooled bottoms, and Hiroshi's primary condenser vapor equates to the new primary condenser vapor. Even with this stream match up there were several differences between the Hiroshi's runs and FEP runs as shown in Table XI.

Table XI. Comparison of Hiroshi and FEP Modeling Runs

Item	Hiroshi Runs	FEP Runs
Waste Feed Type	RPP AN-107 Envelope C-simulant	RPP AZ-102 Envelope B
Waste Feed Volume [L/hr]	0.06	3551
SBS HLW Recycle Feed [L/hr]	None	3405
$1^{st}/2^{nd}$ Caustic Wash-Leach Recycle Feed [L/hr]	None	79
Waste Feed Na molarity	5.5	2.65
Evaporator Feed Na Molarity	5.5	1.56E-4
Evaporator Conc. Na molarity	8	4.5
Waste Feed Vol/ Evap Conc Vol	1.4	1.58
Evap Feed Vol/ Evap Conc Vol	1.4	29100
Evap Conc Density	1.35	1.22

The primary difference between the two runs is that the FEP evaporator concentrated its feed more than Hiroshi evaporator and the waste feed evaporator added more water to the total evaporator feed via the SBS high level waste recycle. The physical structure of the FEP offgas regulatory OLI model is different than Hiroshi's model (REG_C). The FEP offgas OLI model incorporates the 5-stage waste feed evaporator model to calculate the composition of the caustic washing total recycle whereas the earlier OLI model did not. The FEP offgas OLI model has the HLW offgas condensate (SBS Recycle) stream whereas the earlier OLI model did not. The earlier model also added a significant amount of acetone to its feed to match the experimental setup whereas the FEP model spiked organic components directly. The earlier model also set the evaporator vapor target at 18450 gmol or 0.29 molar vapor target whereas the FEP model set the vapor target to achieve a certain ultrafiltrate density (nominally at 0.69 molar vapor target). Despite these differences, a comparison of the two task's work would help validate the new FEP offgas OLI model since Hiroshi's work included experimental results. Table XIV shows a side by side comparison of the new FEP offgas regulatory runs described in this document and the earlier OLI model's results. In order to make this comparison, several modifications were made to the FEP OLI model as explained next.

For the first comparison the FEP HLW Offgas Condensate (SBS Recycle) stream and Total Recycle were dropped leaving only the Envelope B/D waste feed into the evaporator. This condition more closely matches the earlier OLI model with only the AN-107 waste feed. Also for this first case, the vapor target of the evaporator in the FEP model was changed from 0.69 to 0.29 to match the earlier OLI model. Note the earlier model was not concerned with the density of the ultrafiltrate stream whereas the FEP model evaporator vapor target was set to produce an ultrafiltrate stream with a 1.22 density. Running the FEP model with these modifications, the condensate had about 2 times more benzene, 4-methyl-2-pentanone, toluene, 1,2-dibromoethane, chlorobenzene, 1,2,3-trichloropropane, 1,2,4-trichlorobenzene, and naphthalene than the earlier model's condensate. The FEP condensate had about the same order of magnitude of Pentachlorophenol, Pyrene, Bis(ethylhexyl)phthalate (BEHP), and Aldrin. These results are not surprising since the earlier model had a different feed than the FEP OLI model. Table XV shows the

[11] Saito, Hiroshi H., T. Bond Calloway, Daro M. Ferrara, Alexander S. Choi, "Regulatory Off-gas Analysis form the Evaporation of Hanford Simulated Waste Spiked with Organic Compounds," Journal of Air and Waste Management Association, July 2002.

state of the earlier OLI model and FEP OLI model waste feeds. Table XVI shows a comparison of the composition of the different waste feeds as well as the HLW offgas condensate (SBS Recycle) and total recycle feeds. The FEP waste feed has 25% more water by mass than the earlier model's waste feed. To evaporate this extra water more energy is put into the evaporator and thus more of the volatile and semi-volatile organics are carried up with the evaporator overhead into the condenser where they then exit via the condensate.

As a second comparison, the FEP OLI model was run with the evaporator vapor target of 0.69 which gives the desired ultrafiltrate density when the HLW offgas condensate (SBS Recycle) and total recycle streams are present. For this run these two streams were not included to examine the impact of the evaporator vapor target. By essentially doubling the amount of vapor going out the evaporator, the amount of most volatile organics in the condensate doubled from the prior run. In a few cases, the amounts of Bis(ethylhexyl)phthalate, Dibenz[a,h]anthracene, and Diethyl phthalate in the condensate tripled. However, the amounts of phenol, Hexachlorobenzene, Pyrene, Benzo(a)pyrene, and gamma-BHC (Lindane) stayed about the same. These species have high boiling points and are less affected by the additional heat coming into the system.

For a third comparison, the HLW Offgas Condensate (SBS Recycle) and Total recycle streams were added back to the FEP OLI model in the same proportion as the current FEP model and the evaporator vapor target was kept at 0.69 to achieve 1.22 density for the ultrafiltrate stream. This run does not match the proper production rate but has all feed streams in the right proportion. In this FEP run the amounts of most organics in the condensate again doubled from the prior run. In some cases, (e.g. phenol) the amount tripled in the condensate. These increases are due to the large amount of water added via the HLW offgas condensate and total recycle streams. To evaporate this extra water required about twice the heat duty. As a result, the volatile and semi-volatile species going out overhead essentially doubled. For 4-methyl-2-pentanone (MIBK) , Hexachlorobenzene , Pentachlorophenol , Pyrene , Benzo(a)pyrene , 2-Chloronaphthalene , Diethyl phthalate , Aldrin , and gamma-BHC (Lindane) the amount in the condensate stayed on the same order of magnitude. Again these species have the higher boiling points and are less affected by the increased heat entering the system.

Table XII. Organic and Mercury Partitioning of Modeling Ultrafiltrate 1.22 Density Case[8]

				% of Evap Feed+Total recycle										
Stream		Total Recycle	Evap Feed	Over-head	Cooled Evap Bott	PC Vapor	PC Conden-sate	IC Vapor	IC Conden-sate	AC Vapor	AC Conden-sate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Phase		Mixed	Mixed											
Temperature, C		25	25											
Pressure, atm		1	1											
pH		13.4748	13.0705											
Total mol/hr		4402.02	197463											
Flow Units		g/hr	g/hr											
ALDRINE	Aldrin	1.57E-04	4.195	85.66%	14.34%	0.22%	85.44%	0.07%	0.15%	0.01%	0.06%	0.01%	0.00%	85.65%
BENZENE	Benzene	7.74E-07	4.194	100%	0.00%	90.23%	9.76%	90.01%	0.22%	89.26%	0.75%	89.26%	0.00%	10.74%
BETHXPHTH2	Bis(2-ethylhexyl) phthalate (BEHP)	1.97E-03	4.193	42.70%	57.30%	0.01%	42.69%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	42.70%
BNZPYREN	Benzo(a)pyrene (BaP)	9.24E-06	4.181	0.00%	100%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C6H5OH	***Phenol***	***2.75E-02***	***4.196***	***0.15%***	***99.85%***	***0.00%***	***0.15%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.15%***
CL5PHENOL	Pentachlorophenol	2.37E-03	4.196	90.84%	9.16%	0.14%	90.69%	0.01%	0.14%	0.00%	0.01%	0.00%	0.00%	90.83%
CL6BENZEN	Hexachlorobenzene	2.20E-05	4.188	0.00%	100%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CLBENZEN	Chlorobenzene	1.66E-06	4.190	99.99%	0.01%	82.59%	17.40%	82.19%	0.40%	80.87%	1.32%	80.87%	0.00%	19.13%
CLNAPHTH2	***2-Chloronaphthalene***	***4.46E-06***	***4.194***	***99.98%***	***0.02%***	***50.84%***	***49.14%***	***49.76%***	***1.08%***	***46.38%***	***3.39%***	***46.37%***	***0.01%***	***53.61%***
DBANTHAH	***Dibenz[a,h]anthracene***	***1.10E-03***	***4.191***	***0.22%***	***99.78%***	***0.00%***	***0.22%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.22%***
DBRE12	1,2-dibromoethane	3.99E-05	28.063	99.98%	0.02%	53.16%	46.82%	52.10%	1.06%	48.76%	3.34%	48.76%	0.00%	51.22%
DIETPHTHL	***Diethyl phthalate***	***5.99E-03***	***4.202***	***78.05%***	***21.94%***	***0.04%***	***78.02%***	***0.00%***	***0.04%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***78.06%***
HGCL2	Mercury Chloride			4.60%	96.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HGEL	Mercury (sol)	3.80E-06		100%	0.00%	12.26%	87.73%	5.37%	6.90%	1.53%	3.84%	1.22%	0.32%	98.78%
HGO	Mercuric Oxide (insol)	9.85E-01	136.067	0.00%	100%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HXCL13BD	***Hexachlorobutadiene***	***3.47E-08***	***4.200***	***100.00%***	***0.00%***	***99.28%***	***0.72%***	***99.27%***	***0.01%***	***99.23%***	***0.04%***	***99.23%***	***0.00%***	***0.77%***
LINDANE	***gamma-BHC (Lindane)***	***9.69E-05***	***4.209***	***99.56%***	***0.44%***	***5.93%***	***93.64%***	***4.43%***	***1.49%***	***2.08%***	***2.35%***	***2.08%***	***0.00%***	***97.49%***
M4PNTON2	4-methyl-2-pentanone (MIBK)	1.85E-05	4.197	99.93%	0.07%	23.37%	76.56%	21.73%	1.64%	17.33%	4.41%	17.32%	0.00%	82.61%
NAPHTHALEN	Naphthalene	4.91E-06	4.188	99.98%	0.02%	60.12%	39.86%	59.22%	0.90%	56.35%	2.87%	56.34%	0.00%	43.64%
PYRENE	Pyrene	1.52E-04	4.202	96.12%	3.88%	1.06%	95.06%	0.56%	0.50%	0.14%	0.43%	0.13%	0.01%	96.00%
TCLBNZ124	1,2,4-trichlorobenzene	1.04E-06	4.193	100.00%	0.00%	83.04%	16.96%	82.66%	0.38%	81.40%	1.26%	81.40%	0.00%	18.60%
TCLPRP123	1,2,3-trichloropropane	7.30E-06	4.198	99.97%	0.03%	44.56%	55.42%	43.32%	1.24%	39.51%	3.81%	39.51%	0.00%	60.47%
TOLUENE	Toluene	6.43E-07	4.194	100.00%	0.00%	91.37%	8.63%	91.17%	0.20%	90.50%	0.66%	90.50%	0.00%	9.49%
Total g/hr		85260.4	4.01E+06											
Volume, L/hr		79.456	3550.76											

Table XIII. Organic and Mercury Partitioning of Modeling Ultrafiltrate 1.35 Density Case[8]

				% of Evap Feed+Total recycle										
Stream		Total Recycle	Evap Feed	Over-head	Cooled Evap Bott	PC Vapor	PC Conden-sate	IC Vapor	IC Condensate	AC Vapor	AC Conden-sate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Phase		Mixed	Mixed											
Temperature, C		25	25											
Pressure, atm		1	1											
pH		12.8607	13.0705											
Total mol/hr		7912.79	197463											
Flow Units		g/hr	g/hr											
ALDRINE	Aldrin	7.20E-05	4.195	89.58%	10.42%	0.22%	89.36%	0.08%	0.14%	0.01%	0.07%	0.01%	0.00%	89.57%
BENZENE	Benzene	3.54E-07	4.194	100.00%	0.00%	88.52%	11.47%	88.30%	0.22%	87.57%	0.74%	87.57%	0.00%	12.43%
BETHXPHTH2	Bis(2-ethylhexyl) phthalate (BEHP)	9.54E-04	4.193	53.47%	46.53%	0.01%	53.46%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	53.47%
BNZPYREN	Benzo(a)pyrene (BaP)	6.75E-06	4.181	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C6H5OH	***Phenol***	***5.36E-02***	***4.196***	***0.11%***	***99.89%***	***0.00%***	***0.11%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.11%***
CL5PHENOL	Pentachlorophenol	1.16E-03	4.196	97.37%	2.62%	0.13%	97.24%	0.01%	0.12%	0.00%	0.01%	0.00%	0.00%	97.37%
CL6BENZEN	Hexachlorobenzene	1.61E-05	4.188	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CLBENZEN	Chlorobenzene	7.59E-07	4.190	100.00%	0.00%	79.84%	20.16%	79.46%	0.38%	78.18%	1.28%	78.18%	0.00%	21.82%
CLNAPHTH2	***2-Chloronaphthalene***	***2.04E-06***	***4.194***	***99.99%***	***0.01%***	***46.50%***	***53.49%***	***45.52%***	***0.98%***	***42.43%***	***3.09%***	***42.42%***	***0.00%***	***57.57%***
DBANTHAH	***Dibenz[a,h]anthracene***	***5.20E-04***	***4.191***	***0.30%***	***99.70%***	***0.00%***	***0.30%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.30%***
DBRE12	1,2-dibromoethane	1.82E-05	28.063	100.00%	0.01%	48.65%	51.34%	47.69%	0.97%	44.63%	3.06%	44.63%	0.00%	55.36%
DIETPHTHL	***Diethyl phthalate***	***3.29E-03***	***4.202***	***93.72%***	***6.28%***	***0.04%***	***93.69%***	***0.00%***	***0.04%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***93.72%***
HGCL2	Mercury Chloride			4.60%	96.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HGEL	Mercury (sol)	1.74E-06		100.00%	0.00%	12.21%	87.79%	5.35%	6.87%	1.53%	3.82%	1.21%	0.32%	98.79%
HGO	Mercuric Oxide (insol)	1.53E+00	136.067	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HXCL13BD	***Hexachlorobutadiene***	***1.59E-08***	***4.200***	***100.00%***	***0.00%***	***99.17%***	***0.83%***	***99.16%***	***0.01%***	***99.12%***	***0.04%***	***99.12%***	***0.00%***	***0.88%***
LINDANE	***gamma-BHC (Lindane)***	***4.44E-05***	***4.209***	***99.85%***	***0.15%***	***5.08%***	***94.77%***	***3.81%***	***1.28%***	***1.79%***	***2.02%***	***1.78%***	***0.00%***	***98.07%***
M4PNTON2	4-methyl-2-pentanone (MIBK)	8.46E-06	4.197	99.98%	0.02%	20.30%	79.68%	18.88%	1.42%	15.05%	3.83%	15.05%	0.00%	84.94%
NAPHTHALEN	Naphthalene	2.24E-06	4.188	100.00%	0.00%	55.77%	44.23%	54.94%	0.83%	52.27%	2.67%	52.27%	0.00%	47.73%
PYRENE	Pyrene	7.00E-05	4.202	97.35%	2.65%	1.03%	96.31%	0.56%	0.47%	0.14%	0.42%	0.13%	0.01%	97.21%
TCLBNZ124	1,2,4-trichlorobenzene	4.73E-07	4.193	100.00%	0.00%	80.43%	19.57%	80.06%	0.37%	78.85%	1.22%	78.84%	0.00%	21.16%
TCLPRP123	1,2,3-trichloropropane	3.34E-06	4.198	99.99%	0.01%	40.16%	59.83%	39.05%	1.12%	35.61%	3.43%	35.61%	0.00%	64.39%
TOLUENE	Toluene	2.94E-07	4.194	100.00%	0.00%	89.83%	10.17%	89.64%	0.19%	88.99%	0.65%	88.99%	0.00%	11.01%
Total g/hr		152823	4.01E+06											
Volume, L/hr		143.624	3550.76											

Table XIV. Organic Splits compared with Earlier Modeling Work

	EXPERIMENTAL DATA			Original OLI Model			FEP Model with Waste Feed only and evap vapor target like Original OLI Model			FEP Model with Waste Feed only and evap vapor target for 1.22 UF density			FEP Model with Waste Feed, HLW OG Condensate, Total Recycle and evap vapor target for 1.22 UF density		
evaporator vapor target (molar fraction of feed)=				0.29			0.29			0.69			0.69		
Evaporator Concentrate rho=				1.38			1.18			1.39			1.22		
UF1 Filtrate rho=							1.18			1.37			1.22		
Target Organic	Conden-sate	Concen-trate	Off-gas	**Conden-sate= REG_C Condens ate**	**Concen-trate= REG_C Final Concntra te**	**Off-gas =REG_C Vent**	**Conden-sate= FEP PC Condens ate**	**Concen-trate= FEP Cooled Evap Bott**	**Off-gas =FEP PC Vapor**	**Conden-sate= FEP PC Condens ate**	**Concen-trate= FEP Cooled Evap Bott**	**Off-gas =FEP PC Vapor**	**Conden-sate= FEP PC Condens ate**	**Concen-trate= FEP Cooled Evap Bott**	**Off-gas =FEP PC Vapor**
Benzene	0.7%	0.3% *	89.8%	0.4%	0.0%	99.6%	0.7%	0.0%	99.2%	1.7%	0.0%	98.3%	3.4%	0.0%	96.6%
4-methyl-2-pentanone (MIBK)	2.1% *	1.8% *	66.8%	11.9%	0.2%	88.0%	18.1%	0.5%	81.4%	34.9%	0.0%	65.0%	51.5%	0.1%	48.4%
Toluene	0.8%	0.6% *	55.0%	0.4%	0.0%	99.6%	0.6%	0.0%	99.3%	1.5%	0.0%	98.5%	3.0%	0.0%	97.0%
1,2-dibromoethane	18.6%	2.0% *	331.7%	3.5%	0.1%	96.4%	5.6%	0.2%	94.2%	12.6%	0.0%	87.4%	22.3%	0.0%	77.7%
Chlorobenzene	1.2%	0.4% *	39.0%	0.9%	0.0%	99.1%	1.4%	0.0%	98.5%	3.3%	0.0%	96.7%	6.4%	0.0%	93.6%
1,2,3-trichloropropane	5.6% *	16.2% *	0.1%	4.9%	0.1%	95.1%	7.8%	0.2%	92.0%	16.9%	0.0%	83.1%	28.8%	0.0%	71.2%
phenol							0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.2%	99.8%	0.0%
Hexachlorobutadiene							0.1%	0.0%	99.9%	0.1%	0.0%	99.9%	0.2%	0.0%	99.8%
1,2,4-trichlorobenzene	4.4%	6.6% *	86.1%	1.0%	0.0%	99.0%	1.5%	0.0%	98.5%	3.3%	0.0%	96.7%	6.2%	0.0%	93.8%
Naphthalene	16.9%	3.1% *	79.3%	2.8%	0.1%	97.2%	4.4%	0.1%	95.4%	9.9%	0.0%	90.1%	17.7%	0.0%	82.3%
Hexachlorobenzene	0.1%	71.3% *	3.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
Pentachlorophenol	0.0%	174%	0.0%	77.8%	19.4%	2.8%	57.8%	40.9%	1.3%	93.9%	5.2%	0.9%	90.4%	9.2%	0.4%
Pyrene	4.7%	56.5% *	2.1%	88.4%	6.0%	5.6%	74.7%	21.7%	3.6%	89.4%	7.2%	3.5%	92.8%	3.9%	3.3%
Bis(ethylhexyl)phthalate (BEHP)	0.1%	61.2% *	0.0%	12.6%	87.4%	0.0%	7.7%	92.3%	0.0%	22.6%	77.4%	0.0%	42.7%	57.3%	0.0%
Benzo(a)pyrene	0.0%	55.4% *	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
2-Chloronaphthalene							6.9%	0.1%	93.0%	14.1%	0.0%	85.9%	23.9%	0.0%	76.1%
Dibenz[a,h]anthracene							0.0%	100.0%	0.0%	0.1%	99.9%	0.0%	0.2%	99.8%	0.0%
Diethyl phthalate							33.8%	66.0%	0.2%	88.3%	11.4%	0.3%	77.9%	22.0%	0.1%
Aldrin	0.8%	78.1% *	0.0%	67.7%	31.3%	1.0%	42.8%	56.7%	0.5%	71.3%	28.0%	0.6%	85.0%	14.4%	0.7%
gamma-BHC (Lindane)							55.7%	3.0%	41.3%	73.5%	0.4%	26.2%	83.3%	0.4%	16.3%

* from SRTC Analytical Result

Table XV. Hiroshi and FEP Model Waste Feeds

	Hiroshi Feed	**FEP Feeds**		
Stream	Waste Feed (Feed to Evap)	Waste Feed (EVAP REDRXN OUT)	HLW Offgas Condensate (HLW OG Cond)	Total Recycle
Phase	Mixed	Mixed	Mixed	Mixed
Temperature, C	25	25	25	25
Pressure, atm	1	1	1	1
pH	14.0002	13.0705	11.2694	13.4748
Total g/hr	1.50E+06	1.31E+06	1.12E+06	2.78E+04

Table XVI. Hiroshi and FEP Model Waste Feed Compositions[8]

		Hiroshi Feed	**FEP Feeds**		
	Stream	Waste Feed (Feed to Evap)	Waste Feed (EVAP REDRXN OUT)	HLW Offgas Condensate (HLW OG Cond)	Total Recycle
Real Name	**OLI Name**	**Mass Fraction**			
Acetic Acid	ACETACID	0.00E+00	0.00E+00	0.00E+00	1.03E-05
Acetone	ACETONE	7.62E-04	0.00E+00	0.00E+00	0.00E+00
Aluminum Oxide	AL2O3	0.00E+00	6.62E-04	3.58E-07	1.84E-03
Aldrin	***ALDRINE***	9.99E-07	1.05E-06	0.00E+00	1.84E-09
Aluminum Hydrogen EDTA	ALHEDTA	0.00E+00	4.34E-04	0.00E+00	0.00E+00
Aluminum Hydroxide	ALOH3	0.00E+00	7.73E-04	0.00E+00	7.35E-04
Benzene	***BENZENE***	9.99E-07	1.05E-06	0.00E+00	9.08E-12
Bis(ethylhexyl)phthalate (BEHP)	***BETHXPHTH2***	9.99E-07	1.05E-06	0.00E+00	2.31E-08
Benzo(a)pyrene	***BNZPYREN***	9.99E-07	1.04E-06	0.00E+00	1.08E-10
phenol	***C6H5OH***	0.00E+00	1.05E-06	0.00E+00	3.22E-07
Calcium Chloride Oxide	CA2CL2O	0.00E+00	0.00E+00	1.59E-04	0.00E+00
Calcium Oxalate	CAC2O4	0.00E+00	1.68E-04	2.00E-06	0.00E+00
Calcium Oxalate Monohydrate	CAC2O4.1H2O	0.00E+00	0.00E+00	5.99E-07	0.00E+00
Calcium Carbonate	CACO3	0.00E+00	0.00E+00	0.00E+00	2.74E-05
Calcium Dichromate (VI)	CACR2O7	0.00E+00	0.00E+00	0.00E+00	3.25E-05
Calcium Fluoride	CAF2	0.00E+00	8.07E-05	1.56E-04	0.00E+00
Calcium Sulfate	CASO4	3.80E-04	0.00E+00	0.00E+00	0.00E+00
Pentachlorophenol	***CL5PHENOL***	9.99E-07	1.05E-06	0.00E+00	2.78E-08
Hexachlorobenzene	***CL6BENZEN***	9.99E-07	1.04E-06	0.00E+00	2.59E-10
Chlorobenzene	***CLBENZEN***	9.99E-07	1.04E-06	0.00E+00	1.95E-11
2-Chloronaphthalene	***CLNAPHTH2***	0.00E+00	1.05E-06	0.00E+00	5.23E-11
Carbon Dioxide	CO2	3.10E-02	1.96E-02	0.00E+00	6.02E-03
Cesium Acetate	CSACET	0.00E+00	4.92E-05	0.00E+00	1.52E-05
Dibenz[a,h]anthracene	***DBANTHAH***	0.00E+00	1.04E-06	0.00E+00	1.29E-08

		Hiroshi Feed	FEP Feeds		
	Stream	Waste Feed (Feed to Evap)	Waste Feed (EVAP REDRXN OUT)	HLW Offgas Condensate (HLW OG Cond)	Total Recycle
Real Name	**OLI Name**	**Mass Fraction**			
1,2-dibromoethane	***DBRE12***	9.99E-07	6.99E-06	0.00E+00	4.68E-10
Diethyl Phthalate	***DIETPHTHL***	0.00E+00	1.05E-06	0.00E+00	7.03E-08
Iron (III) NTA	FENTA	1.20E-04	0.00E+00	0.00E+00	0.00E+00
Iron (III) Chloride	FECL3	0.00E+00	0.00E+00	3.37E-07	0.00E+00
Iron (III) Oxalate	FEIII2C2O43	0.00E+00	0.00E+00	0.00E+00	4.37E-07
Iron (III) Hydrogen EDTA	FEIIIHEDTA	0.00E+00	0.00E+00	0.00E+00	1.29E-04
Iron (III) Hydroxide	FEIIIOH3	0.00E+00	0.00E+00	4.50E-05	3.42E-04
Gluconic Acid	GLUCONACID	9.39E-04	0.00E+00	0.00E+00	0.00E+00
2,2-Iminobisacetic acid	H2IDA	1.61E-03	2.82E-04	0.00E+00	8.71E-05
Water	H2O	6.69E-01	8.20E-01	9.77E-01	8.88E-01
Hydrogen Chloride	HCL	0.00E+00	0.00E+00	5.42E-03	9.21E-04
Formic Acid	HCOOH	0.00E+00	9.87E-05	0.00E+00	3.05E-05
Hydrogen Floride	HF	0.00E+00	8.44E-04	6.15E-06	1.83E-04
Mercury (elemental)	***HGEL***	0.00E+00	1.57E-05	0.00E+00	4.46E-11
Mercuric Oxide	***HGO***	0.00E+00	1.70E-05	0.00E+00	1.16E-05
Nitrous(III) Acid	HNO2	0.00E+00	2.33E-02	1.08E-03	1.10E-02
Nitric Acid	HNO3	0.00E+00	1.12E-02	5.49E-04	2.72E-02
Hexachlorobutadiene	***HXCL13BD***	0.00E+00	1.05E-06	0.00E+00	4.07E-13
Potassium Citrate	K3CTRT	0.00E+00	7.04E-04	0.00E+00	2.17E-04
Potassium Formate	KCOOH	1.89E-03	0.00E+00	0.00E+00	0.00E+00
Potassium Chloride	KCL	0.00E+00	3.37E-04	5.37E-03	2.61E-03
Potassium Glycolate	KGLYCOLAT	0.00E+00	0.00E+00	0.00E+00	4.08E-04
Potassium Nitrate	KNO3	0.00E+00	5.93E-03	0.00E+00	0.00E+00
gamma-BHC (Lindane)	***LINDANE***	0.00E+00	1.05E-06	0.00E+00	1.14E-09
4-methyl-2-pentanone (MIBK)	***M4PNTON2***	9.99E-07	1.05E-06	0.00E+00	2.17E-10
Magnesium Oxalate	MGC2O4	0.00E+00	0.00E+00	5.99E-07	0.00E+00
Magnesium Dichromate (VI)	MGCR2O7	0.00E+00	0.00E+00	0.00E+00	1.89E-09
Magnesium Hydroxide	MGOH2	0.00E+00	0.00E+00	6.89E-05	7.56E-06
Manganese(II) Oxalate	MNC2O4	0.00E+00	0.00E+00	0.00E+00	1.39E-06
Manganese(II) Hydroxide	MNOH2	0.00E+00	0.00E+00	0.00E+00	8.76E-06
Nitrogen	N2	0.00E+00	0.00E+00	0.00E+00	4.47E-11
Sodium Tetraborate	NA2B4O7	8.02E-05	0.00E+00	0.00E+00	0.00E+00
Sodium Oxalate	NA2C2O4	1.53E-03	3.57E-03	0.00E+00	2.47E-05
Sodium Chromate (VI)	NA2CRO4	1.29E-06	2.08E-03	0.00E+00	6.01E-04
Disodium Dihydrogen EDTA	NA2H2EDTA	2.63E-03	0.00E+00	0.00E+00	0.00E+00
Sodium Molybdate (VI)	NA2MOO4	3.36E-05	0.00E+00	0.00E+00	0.00E+00
Sodium Metasilicate	NA2SIO3	3.13E-05	0.00E+00	0.00E+00	0.00E+00
Sodium Sulfate	NA2SO4	5.45E-03	0.00E+00	0.00E+00	0.00E+00
Sodium Orthophosphate	NA3PO4	1.24E-03	0.00E+00	0.00E+00	0.00E+00
Sodium Acetate	NAACET	3.80E-04	4.57E-05	0.00E+00	0.00E+00

		Hiroshi Feed	FEP Feeds		
	Stream	Waste Feed (Feed to Evap)	Waste Feed (EVAP REDRXN OUT)	HLW Offgas Condensate (HLW OG Cond)	Total Recycle
Real Name	**OLI Name**	**Mass Fraction**			
Sodium Aluminate	NAALO2	5.31E-04	0.00E+00	0.00E+00	0.00E+00
Sodium Chloride	NACL	1.48E-03	0.00E+00	0.00E+00	0.00E+00
Sodium Formate	NACOOH	6.33E-03	0.00E+00	0.00E+00	0.00E+00
Sodium Floride	NAF	3.51E-04	0.00E+00	0.00E+00	0.00E+00
Sodium Glycolate	NAGLYCOLAT	6.46E-03	1.14E-03	0.00E+00	0.00E+00
Sodium Dihydrogen Citrate	NAH2CTRT	2.80E-03	0.00E+00	0.00E+00	0.00E+00
Sodium Dihydrogen NTA	NAH2NTA	6.45E-05	0.00E+00	0.00E+00	0.00E+00
Sodium Nitrite	NANO2	4.25E-02	1.58E-02	8.88E-04	0.00E+00
Sodium Nitrite	NANO3	1.48E-01	0.00E+00	0.00E+00	0.00E+00
Sodium Hydroxide	NAOH	7.43E-02	8.11E-02	7.48E-03	5.62E-02
Naphthalene	***NAPHTHALEN***	9.99E-07	1.04E-06	0.00E+00	5.75E-11
Sodium Aluminosilicate gel	NASGEL.15.5H2O	0.00E+00	0.00E+00	8.49E-04	9.50E-04
Nickel (II) Oxalate	NIC2O4	0.00E+00	0.00E+00	0.00E+00	4.66E-05
Nickel (II) Hydroxide	NIOH2	2.44E-04	0.00E+00	0.00E+00	0.00E+00
Nickel (II) Sulfate	NISO4	1.76E-04	0.00E+00	0.00E+00	0.00E+00
Oxygen	O2	0.00E+00	0.00E+00	0.00E+00	2.49E-11
Phosphorus Pentoxide	P2O5	0.00E+00	1.59E-04	0.00E+00	4.92E-05
Pyrene	***PYRENE***	9.99E-07	1.05E-06	0.00E+00	1.79E-09
Silicon Dioxide	SIO2	0.00E+00	0.00E+00	9.71E-05	4.18E-05
Sulfur Trioxide	SO3	0.00E+00	0.00E+00	1.68E-04	2.37E-03
Strontium Oxalate	SRC2O4	3.67E-05	1.17E-02	0.00E+00	0.00E+00
Strontium Carbonate	SRCO3	6.55E-05	0.00E+00	0.00E+00	0.00E+00
1,2,4-trichlorobenzene	***TCLBNZ124***	9.99E-07	1.05E-06	0.00E+00	1.21E-11
1,2,3-trichloropropane	***TCLPRP123***	9.99E-07	1.05E-06	0.00E+00	8.56E-11
Toluene	***TOLUENE***	9.99E-07	1.05E-06	0.00E+00	7.54E-12
Zinc Dichloride Pentoxide	ZN6CL2O5	0.00E+00	0.00E+00	2.68E-06	0.00E+00
Zinc Oxalate	ZNC2O4	0.00E+00	0.00E+00	0.00E+00	8.76E-05
Zinc Hydroxide	ZNOH2	0.00E+00	0.00E+00	2.12E-04	0.00E+00
Zirconium EDTA	ZREDTA	0.00E+00	0.00E+00	0.00E+00	1.92E-05
Zirconium Oxide	ZRO2	0.00E+00	0.00E+00	0.00E+00	5.19E-05
	Total	1.00E+00	1.00E+00	1.00E+00	1.00E+00

3.0 CONCLUSIONS

More of the volatile and semi-volatile organics in the evaporator feed go out the primary condenser condensate than in earlier OLI models. These increased rates are due to the larger vapor target of the evaporator and the larger amount of water coming into the evaporator. The greater heat duty for the evaporator causes more of the volatiles and semi-volatiles to go out the overhead and condense out. From these earlier comparisons, adjusting the evaporator target does have a significant impact on the organic partitioning. The amount of water entering the evaporator from the HLW offgas condensate (SBS Recycle) and the total recycle have a significant impact.

This work does not reflect the true conditions of mercury in the waste feed evaporator. For this reason it is strongly suggested that the mercury calculations not be used in the evaporator engineering calculations for design. SRTC will be conducting experiments to attempt to provide a mercury mass balance across the waste feed evaporator.[6] This new work will be better suited for mercury analysis and engineering design calculations.

The mercury partitioning based on the assumptions made for this task is fairly straightforward based on the OLI modeling. All the elemental mercury in the feed goes out the evaporator overhead. About 5% of the mercuric chloride in the feed goes out the evaporator overhead. No other mercury species were observed going out the evaporator overhead. All the insoluble mercury goes out the evaporator bottoms. In these OLI models the insoluble mercury was represented as mercuric oxide. How much mercury goes out the evaporator overhead depends on the amount of elemental mercury in the waste feed. For these runs, the soluble mercury in the waste feed came from an assumed amount of soluble mercury based on high contract limits versus actual lower tank values and an assumed 50% reduction of insoluble mercury to elemental mercury. These assumptions can be changed to better reflect actual plant conditions or updated sample data. The organic partitioning is basically unaffected by the mercury assumptions. Therefore, the results can be applied to cases where there is or is not mercury redox, there is or is not elemental mercury in the feed, and there is or is no insoluble mercury in the feed. For example, if no insoluble mercury is reduced and there is no elemental mercury in the feed then the OLI model predicts that only 5% of the mercuric chloride in the feed goes out the overhead. The organic partitioning remains the same despite the partitioning of the mercury.

4.0 ISSUES & RECOMMENDATIONS

In gathering data for the two offgas runs, several runs were done to investigate mercury redox. Based on these runs it appears that the built-in redox for mercury must be modified to more closely match observed mercury redox behavior. Some redox behavior can be inserted into the OLI chemistry model by using kinetic equations. However, the reduction and oxidation are then forced to fit a desired result rather than following standard redox chemistry. The mercury redox behavior in OLI should be studied further so it can be refined to more closely match experimental data. Further, the behavior of soluble and insoluble forms of mercury in OLI need to be investigated to address concerns over the partitioning of mercury between the evaporator overhead and bottoms.

In collecting data for the two offgas runs, several runs were made with different amounts of water coming into the offgas train from the feed streams as well as the steam ejectors and recycle streams. The organic partitioning is significantly impacted by the amount of water being fed into the system due to the volatility of the organics and their solubility in water. The amount of water can be controlled by the amount of excess steam going to the steam ejectors as well as the amount of HLW offgas condensate (SBS Recycle) and Ultrafiltration caustic wash that are recycled back to the evaporator. More studies are needed to quantity the impacts of these variables.

5.0 APPENDIX A –WASTE FEED EVAPORATOR OFFGAS MODEL RESULTS

Figure A-1 shows the organic partitioning in the waste feed evaporator offgas model for the run with the ultrafiltration filtrate (UF1 Filtrate) at a density of 1.22 g/ml. Figure A-2 shows organic partitioning in the waste feed evaporator offgas OLI model for the run with ultrafiltration filtrate (UF1 Filtrate) with a density of 1.35 g/ml. These schematics are provided as one-page summaries of the offgas regulatory run results.

Table A- 1 shows the complete OLI model output for all species for ultrafiltration filtrate (UF1 Filtrate) at a density of 1.22 g/ml. Table A- 2 shows the complete model output for all species for ultrafiltration filtrate (UF1 Filtrate) at a density of 1.35 g/ml. From this data all prior discussed results are derived.

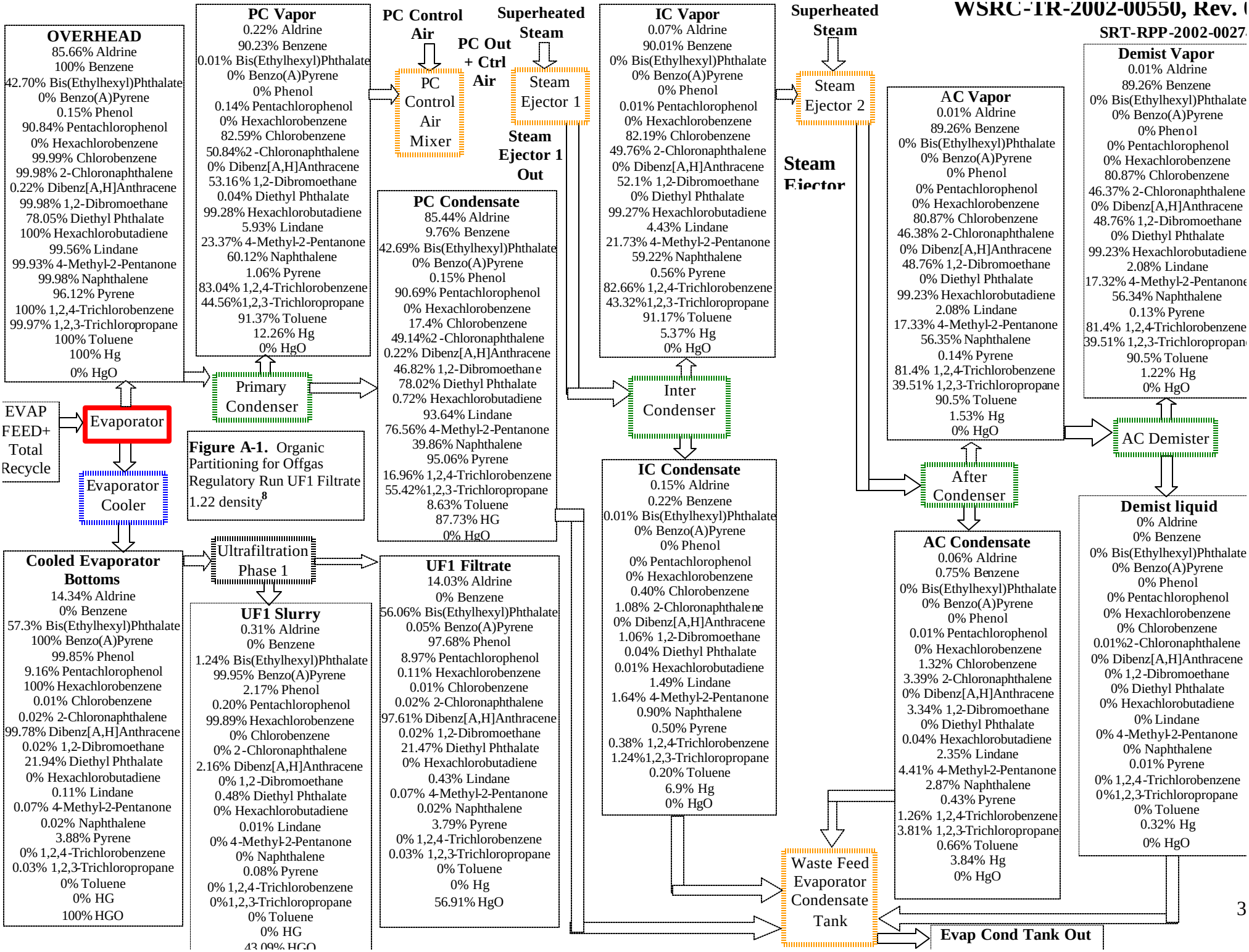

OVERHEAD
85.66% Aldrine
100% Benzene
42.70% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0.15% Phenol
90.84% Pentachlorophenol
0% Hexachlorobenzene
99.99% Chlorobenzene
99.98% 2-Chloronaphthalene
0.22% Dibenz[A,H]Anthracene
99.98% 1,2-Dibromoethane
78.05% Diethyl Phthalate
100% Hexachlorobutadiene
99.56% Lindane
99.93% 4-Methyl-2-Pentanone
99.98% Naphthalene
96.12% Pyrene
100% 1,2,4-Trichlorobenzene
99.97% 1,2,3-Trichloropropane
100% Toluene
100% Hg
0% HgO
EVAP FEED+ Total Recycle
Evaporator
Evaporator Cooler
Cooled Evaporator Bottoms
14.34% Aldrine
0% Benzene
57.3% Bis(Ethylhexyl)Phthalate
100% Benzo(A)Pyrene
99.85% Phenol
9.16% Pentachlorophenol
100% Hexachlorobenzene
0.01% Chlorobenzene
0.02% 2-Chloronaphthalene
99.78% Dibenz[A,H]Anthracene
0.02% 1,2-Dibromoethane
21.94% Diethyl Phthalate
0% Hexachlorobutadiene
0.11% Lindane
0.07% 4-Methyl-2-Pentanone
0.02% Naphthalene
3.88% Pyrene
0% 1,2,4-Trichlorobenzene
0.03% 1,2,3-Trichloropropane
0% Toluene
0% HG
100% HGO
PC Vapor
0.22% Aldrine
90.23% Benzene
0.01% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0% Phenol
0.14% Pentachlorophenol
0% Hexachlorobenzene
82.59% Chlorobenzene
50.84%2-Chloronaphthalene
0% Dibenz[A,H]Anthracene
53.16% 1,2-Dibromoethane
0.04% Diethyl Phthalate
99.28% Hexachlorobutadiene
5.93% Lindane
23.37% 4-Methyl-2-Pentanone
60.12% Naphthalene
1.06% Pyrene
83.04% 1,2,4-Trichlorobenzene
44.56%1,2,3-Trichloropropane
91.37% Toluene
12.26% Hg
0% HgO
Primary Condenser
Figure A-1. Organic Partitioning for Offgas Regulatory Run UF1 Filtrate 1.22 density[8]
Ultrafiltration Phase 1
UF1 Slurry
0.31% Aldrine
0% Benzene
1.24% Bis(Ethylhexyl)Phthalate
99.95% Benzo(A)Pyrene
2.17% Phenol
0.20% Pentachlorophenol
99.89% Hexachlorobenzene
0% Chlorobenzene
0% 2-Chloronaphthalene
2.16% Dibenz[A,H]Anthracene
0% 1,2-Dibromoethane
0.48% Diethyl Phthalate
0% Hexachlorobutadiene
0.01% Lindane
0% 4-Methyl-2-Pentanone
0% Naphthalene
0.08% Pyrene
0% 1,2,4-Trichlorobenzene
0%1,2,3-Trichloropropane
0% Toluene
0% HG
43.09% HGO
PC Control Air
PC Control Air Mixer
PC Out + Ctrl Air
Superheated Steam
Steam Ejector 1
Steam Ejector 1 Out
PC Condensate
85.44% Aldrine
9.76% Benzene
42.69% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0.15% Phenol
90.69% Pentachlorophenol
0% Hexachlorobenzene
17.4% Chlorobenzene
49.14%2-Chloronaphthalene
0.22% Dibenz[A,H]Anthracene
46.82% 1,2-Dibromoethane
78.02% Diethyl Phthalate
0.72% Hexachlorobutadiene
93.64% Lindane
76.56% 4-Methyl-2-Pentanone
39.86% Naphthalene
95.06% Pyrene
16.96% 1,2,4-Trichlorobenzene
55.42%1,2,3-Trichloropropane
8.63% Toluene
87.73% HG
0% HgO
UF1 Filtrate
14.03% Aldrine
0% Benzene
56.06% Bis(Ethylhexyl)Phthalate
0.05% Benzo(A)Pyrene
97.68% Phenol
8.97% Pentachlorophenol
0.11% Hexachlorobenzene
0.01% Chlorobenzene
0.02% 2-Chloronaphthalene
97.61% Dibenz[A,H]Anthracene
0.02% 1,2-Dibromoethane
21.47% Diethyl Phthalate
0% Hexachlorobutadiene
0.43% Lindane
0.07% 4-Methyl-2-Pentanone
0.02% Naphthalene
3.79% Pyrene
0% 1,2,4-Trichlorobenzene
0.03% 1,2,3-Trichloropropane
0% Toluene
0% Hg
56.91% HgO
IC Vapor
0.07% Aldrine
90.01% Benzene
0% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0% Phenol
0.01% Pentachlorophenol
0% Hexachlorobenzene
82.19% Chlorobenzene
49.76% 2-Chloronaphthalene
0% Dibenz[A,H]Anthracene
52.1% 1,2-Dibromoethane
0% Diethyl Phthalate
99.27% Hexachlorobutadiene
4.43% Lindane
21.73% 4-Methyl-2-Pentanone
59.22% Naphthalene
0.56% Pyrene
82.66% 1,2,4-Trichlorobenzene
43.32%1,2,3-Trichloropropane
91.17% Toluene
5.37% Hg
0% HgO
Inter Condenser
IC Condensate
0.15% Aldrine
0.22% Benzene
0.01% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0% Phenol
0% Pentachlorophenol
0% Hexachlorobenzene
0.40% Chlorobenzene
1.08% 2-Chloronaphthalene
0% Dibenz[A,H]Anthracene
1.06% 1,2-Dibromoethane
0.04% Diethyl Phthalate
0.01% Hexachlorobutadiene
1.49% Lindane
1.64% 4-Methyl-2-Pentanone
0.90% Naphthalene
0.50% Pyrene
0.38% 1,2,4-Trichlorobenzene
1.24%1,2,3-Trichloropropane
0.20% Toluene
6.9% Hg
0% HgO
Superheated Steam
Steam Ejector 2
Steam Ejector
AC Vapor
0.01% Aldrine
89.26% Benzene
0% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0% Phenol
0% Pentachlorophenol
0% Hexachlorobenzene
80.87% Chlorobenzene
46.38% 2-Chloronaphthalene
0% Dibenz[A,H]Anthracene
48.76% 1,2-Dibromoethane
0% Diethyl Phthalate
99.23% Hexachlorobutadiene
2.08% Lindane
17.33% 4-Methyl-2-Pentanone
56.35% Naphthalene
0.14% Pyrene
81.4% 1,2,4-Trichlorobenzene
39.51% 1,2,3-Trichloropropane
90.5% Toluene
1.53% Hg
0% HgO
After Condenser
AC Condensate
0.06% Aldrine
0.75% Benzene
0% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0% Phenol
0.01% Pentachlorophenol
0% Hexachlorobenzene
1.32% Chlorobenzene
3.39% 2-Chloronaphthalene
0% Dibenz[A,H]Anthracene
3.34% 1,2-Dibromoethane
0% Diethyl Phthalate
0.04% Hexachlorobutadiene
2.35% Lindane
4.41% 4-Methyl-2-Pentanone
2.87% Naphthalene
0.43% Pyrene
1.26% 1,2,4-Trichlorobenzene
3.81% 1,2,3-Trichloropropane
0.66% Toluene
3.84% Hg
0% HgO
AC Demister
Demist Vapor
0.01% Aldrine
89.26% Benzene
0% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0% Phenol
0% Pentachlorophenol
0% Hexachlorobenzene
80.87% Chlorobenzene
46.37% 2-Chloronaphthalene
0% Dibenz[A,H]Anthracene
48.76% 1,2-Dibromoethane
0% Diethyl Phthalate
99.23% Hexachlorobutadiene
2.08% Lindane
17.32% 4-Methyl-2-Pentanone
56.34% Naphthalene
0.13% Pyrene
81.4% 1,2,4-Trichlorobenzene
39.51% 1,2,3-Trichloropropane
90.5% Toluene
1.22% Hg
0% HgO
Demist liquid
0% Aldrine
0% Benzene
0% Bis(Ethylhexyl)Phthalate
0% Benzo(A)Pyrene
0% Phenol
0% Pentachlorophenol
0% Hexachlorobenzene
0% Chlorobenzene
0.01%2-Chloronaphthalene
0% Dibenz[A,H]Anthracene
0% 1,2-Dibromoethane
0% Diethyl Phthalate
0% Hexachlorobutadiene
0% Lindane
0% 4-Methyl-2-Pentanone
0% Naphthalene
0.01% Pyrene
0% 1,2,4-Trichlorobenzene
0%1,2,3-Trichloropropane
0% Toluene
0.32% Hg
0% HgO
Waste Feed Evaporator Condensate Tank
Evap Cond Tank Out

Table A-1. Waste Feed Evaporator Offgas Model Output for UF1 Filtrate Density of 1.22 g/ml[8]

Stream	HLW OG Cond	Total Recycle	Evap Feed	EVAP REDRXN OUT	Air Inleakage	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott
Phase	Mixed	Mixed	Mixed	Mixed	Vapor	Mixed	Vapor	Mixed	Mixed
Temperature, C	25	25	25	50	25	50	50	50	25
Pressure, atm	1	1	1	0.108335	1	0.108583	0.108583	0.108583	1
pH	11.2694	13.4748	13.0705	12.6538		12.6388		12.6388	13.5083
Total mol/hr	188132	4402.02	197463	390030	135.18	390165	268642	121522	121511
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer				1.430E-18		1.440E-18	1.440E-18		
Acetic Acid		8.809E-01		2.647E-06		2.643E-06	2.643E-06		
Aluminum Oxide	1.231E+00	1.567E+02	2.657E+03	4.810E+03		4.810E+03		4.810E+03	4.243E+03
Aldrin		***1.568E-04***	***4.195E+00***	***4.195E+00***		***4.195E+00***	***3.593E+00***	***6.018E-01***	***6.018E-01***
Aluminum Hydrogen EDTA			1.741E+03	1.190E+03		1.190E+03		1.190E+03	1.429E+03
Aluminum Hydroxide		6.264E+01	3.103E+03						7.799E+02
Benzene		***7.739E-07***	***4.194E+00***	***4.194E+00***		***4.194E+00***	***4.193E+00***	***1.189E-04***	***1.189E-04***
Bis(2-ethylhexyl)phthalate (BEHP)		***1.971E-03***	***4.193E+00***	***4.195E+00***		***4.195E+00***	***1.791E+00***	***2.404E+00***	***2.404E+00***
Benzo(a)pyrene (BaP)		***9.236E-06***	***4.181E+00***	***4.181E+00***		***4.181E+00***		***4.181E+00***	***4.181E+00***
Phenol		***2.747E-02***	***4.196E+00***	***4.223E+00***		***4.223E+00***	***6.495E-03***	***4.217E+00***	***4.217E+00***
Calcium Chloride Oxide	5.455E+02								
Calcium Oxalate	6.886E+00		6.736E+02	2.279E+02		2.251E+02		2.251E+02	4.127E+02
Calcium Oxalate Monohydrate	2.059E+00								
Calcium Carbonate		2.337E+00							
Calcium Dichromate (VI)		2.770E+00							
Calcium Fluoride	5.358E+02		3.237E+02	1.649E+03		1.651E+03		1.651E+03	1.536E+03
Pentachlorophenol		***2.372E-03***	***4.196E+00***	***4.199E+00***		***4.199E+00***	***3.814E+00***	***3.848E-01***	***3.848E-01***
Hexachlorobenzene		***2.205E-05***	***4.188E+00***	***4.188E+00***		***4.188E+00***		***4.188E+00***	***4.188E+00***
Chlorobenzene		***1.660E-06***	***4.190E+00***	***4.190E+00***		***4.190E+00***	***4.190E+00***	***2.554E-04***	***2.554E-04***
2-Chloronaphthalene		***4.459E-06***	***4.194E+00***	***4.194E+00***		***4.194E+00***	***4.193E+00***	***7.931E-04***	***7.931E-04***
Carbon Dioxide		5.136E+02	7.847E+04	7.899E+04	1.949E+00	7.899E+04	2.500E-01	7.899E+04	7.899E+04
Cesium Acetate		1.293E+00	1.972E+02	1.985E+02		1.985E+02		1.985E+02	1.985E+02
Dibenz[a,h]anthracene		***1.102E-03***	***4.191E+00***	***4.192E+00***		***4.192E+00***	***9.406E-03***	***4.182E+00***	***4.182E+00***
1,2-dibromoethane		***3.989E-05***	***2.806E+01***	***2.806E+01***		***2.806E+01***	***2.806E+01***	***6.127E-03***	***6.127E-03***
Diethyl phthalate		***5.992E-03***	***4.202E+00***	***4.208E+00***		***4.208E+00***	***3.284E+00***	***9.234E-01***	***9.234E-01***
Iron (III) Chloride	1.159E+00								
Iron (III) Oxalate		3.728E-02							
Iron (III) Hydrogen EDTA		1.097E+01		6.074E+02		6.074E+02		6.074E+02	3.388E+02
Iron (III) Hydroxide	1.547E+02	2.919E+01							8.318E+01
Formic Acid, dimer				7.040E-25		7.088E-25	7.088E-25		
Hydrofluoride, dimer				2.008E-22		2.039E-22	2.039E-22		
2,2'-Iminobisacetic acid		7.425E+00	1.132E+03	1.140E+03		1.140E+03		1.140E+03	1.140E+03
Water	3.361E+06	7.570E+04	3.290E+06	6.727E+06	1.819E+01	6.727E+06	4.837E+06	1.890E+06	1.891E+06
Sulfuric Acid									
Hydrogen Chloride	1.862E+04	7.852E+01		1.035E+04		1.035E+04	4.604E-11	1.035E+04	1.035E+04
Formic Acid		2.597E+00	3.961E+02	3.987E+02		3.987E+02	2.927E-07	3.987E+02	3.987E+02
Hydrofluoric Acid	2.116E+01	1.559E+01	3.388E+03	3.020E+03		3.019E+03	1.686E-07	3.019E+03	3.077E+03
Mercury (II) Chloride				2.220E-07		2.240E-07	2.240E-07		
Mercury (elemental)		3.801E-06		6.349E+01		6.349E+01	6.349E+01	5.835E-04	5.835E-04
Mercury (II) Oxide		9.851E-01	1.361E+02	6.850E+01		6.850E+01		6.850E+01	6.850E+01
Nitrous (III) Acid	3.708E+03	9.338E+02	9.353E+04	9.748E+04		9.766E+04	8.501E-03	9.766E+04	9.342E+04
Nitric Acid	1.888E+03	2.317E+03	4.511E+04	6.417E+04		6.417E+04	1.712E-11	6.417E+04	6.417E+04
Hexachlorobutadiene		***3.470E-08***	***4.200E+00***	***4.200E+00***		***4.200E+00***	***4.200E+00***	***1.133E-05***	***1.133E-05***
Potassium Citrate		1.851E+01	2.823E+03	2.842E+03		2.842E+03		2.842E+03	2.842E+03
Potassium Chloride	1.845E+04	2.222E+02	1.350E+03	3.760E+04		3.760E+04		3.760E+04	3.760E+04
Potassium Glycolate		3.479E+01							
Potassium Nitrate (VI)			2.380E+04						
gamma-BHC (Lindane)		***9.689E-05***	***4.209E+00***	***4.209E+00***		***4.209E+00***	***4.190E+00***	***1.845E-02***	***1.845E-02***
4-methyl-2-pentanone (MIBK)		***1.850E-05***	***4.197E+00***	***4.197E+00***		***4.197E+00***	***4.194E+00***	***2.840E-03***	***2.840E-03***
Magnesium Oxalate	2.060E+00			2.879E-02		2.947E-02		2.947E-02	1.594E-02
Magnesium Dichromate (VI)		1.612E-04							

Stream	HLW OG Cond	Total Recycle	Evap Feed	EVAP REDRXN OUT	Air Inleakage	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott
Magnesium Hydroxide	2.368E+02	6.448E-01		2.385E+02		2.385E+02		2.385E+02	2.385E+02
Manganese (II) Oxalate		1.182E-01		1.319E+00		1.319E+00		1.319E+00	1.319E+00
Manganese (II) Hydroxide		7.470E-01							
Nitrogen		3.815E-06		3.815E-06	2.970E+03	2.970E+03	2.970E+03	5.856E-04	5.856E-04
Sodium Oxalate		2.103E+00	1.433E+04	1.381E+04		1.382E+04		1.382E+04	1.362E+04
Sodium Chromate (VI)		5.125E+01	8.349E+03	8.404E+03		8.404E+03		8.404E+03	8.404E+03
Sodium Acetate			1.835E+02	1.847E+02		1.847E+02		1.847E+02	1.847E+02
Sodium Glycolate			4.556E+03	4.586E+03		4.586E+03		4.586E+03	4.586E+03
Sodium Nitrite	3.054E+03		6.327E+04	6.731E+04		6.704E+04		6.704E+04	7.327E+04
Sodium Hydroxide	2.572E+04	4.789E+03	3.253E+05	3.554E+05		3.555E+05		3.555E+05	3.520E+05
Naphthalene		***4.906E-06***	***4.188E+00***	***4.188E+00***		***4.188E+00***	***4.188E+00***	***7.733E-04***	***7.733E-04***
Sodium Aluminosilicate Gel	2.920E+03	8.103E+01		3.617E+03		3.618E+03		3.618E+03	3.690E+03
Nickel (II) Oxalate		3.977E+00		3.977E+00		3.977E+00		3.977E+00	3.977E+00
Oxygen		2.122E-06		2.122E-06	8.994E+02	8.994E+02	8.994E+02	3.258E-04	3.258E-04
Phosphorus Pentoxide		4.191E+00	6.391E+02	6.433E+02		6.433E+02		6.433E+02	6.433E+02
PYRENE		***1.524E-04***	***4.202E+00***	***4.202E+00***		***4.202E+00***	***4.039E+00***	***1.629E-01***	***1.629E-01***
Silicon Dioxide	3.339E+02	3.561E+00		1.142E+02		1.141E+02		1.141E+02	8.786E+01
Sulfur Trioxide	5.781E+02	2.021E+02	4.702E+04	4.780E+04		4.780E+04		4.780E+04	4.780E+04
1,2,4-trichlorobenzene		***1.035E-06***	***4.193E+00***	***4.193E+00***		***4.193E+00***	***4.193E+00***	***1.800E-04***	***1.800E-04***
1,2,3-trichloropropane		***7.301E-06***	***4.198E+00***	***4.198E+00***		***4.198E+00***	***4.197E+00***	***1.123E-03***	***1.123E-03***
TOLUENE		***6.433E-07***	***4.194E+00***	***4.194E+00***		***4.194E+00***	***4.194E+00***	***9.908E-05***	***9.908E-05***
Zinc Dichloride Pentoxide	9.198E+00								
Zinc Oxalate		7.471E+00		1.147E+03		1.147E+03		1.147E+03	1.147E+03
Zinc Hydroxide	7.281E+02								
Zirconium EDTA		1.634E+00		6.821E+00		6.806E+00		6.806E+00	1.525E+01
Zirconium Oxide		4.421E+00		2.737E+00		2.742E+00		2.742E+00	
Total g/hr	3.438E+06	8.526E+04	4.012E+06	7.535E+06	3.889E+03	7.539E+06	4.841E+06	2.698E+06	2.698E+06
Volume, L/hr	3.405E+03	7.946E+01	3.551E+03	6.617E+07	3.307E+03	6.552E+07	6.552E+07	2.252E+03	2.203E+03
Enthalpy, cal/hr	-1.289E+10	-3.074E+08	-1.404E+10	-2.430E+10	-6.275E+04	-2.432E+10	-1.547E+10	-8.855E+09	-8.904E+09
Vapor fraction				6.940E-01	1.000E+00	6.885E-01	1.000E+00		
Solid fraction	1.181E-04	2.782E-04	2.237E-04	1.381E-04		1.316E-04		4.226E-04	8.146E-04
Organic fraction		9.595E-10	4.886E-07	6.340E-08		6.354E-08		2.040E-07	1.996E-07
Osmotic Pres, atm	1.256E+01	6.077E+01	9.071E+01	1.802E+02		1.774E+02		1.774E+02	1.739E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.639E-02	1.235E-01	1.378E-01	3.040E-01		1.860E-01		1.860E-01	2.012E-01
E-Con, cm2/ohm-mol	9.004E+01	4.892E+01	6.830E+01	4.044E+01		2.497E+01		2.497E+01	2.663E+01
Abs Visc, cP	9.062E-01	1.150E+00	1.494E+00	1.444E+00		1.421E+00		1.421E+00	2.328E+00
Rel Visc	1.017E+00	1.291E+00	1.678E+00	2.639E+00		2.597E+00		2.597E+00	2.613E+00
Ionic Strength	2.815E-01	1.596E+00	3.062E+00	5.903E+00		5.791E+00		5.791E+00	5.571E+00

Table A-1. Waste Feed Evaporator Offgas Model Output for UF1 Filtrate Density of 1.22 g/ml (cont'd) [8]

Stream	UF1 Filtrate	UF1 Slurry	PC Vapor	PC Condensate	PC Control Air	PC Vap + CtrlAir	Super Steam 1	Stm Eject 1 Out	IC Vapor
Phase	Mixed	Mixed	Vapor	Mixed	Vapor	Vapor	Aqueous	Mixed	Vapor
Temperature, C	25	25	40	40	25	34.7136	133	58.2385	40
Pressure, atm	1	1	0.103151	0.103151	1	0.0979798	8.41674	0.294007	0.279311
pH	13.5083	13.5083		6.64281			5.90373	6.24478	
Total mol/hr	118779	2732.49	460.579	268182	270.36	730.939	2517.81	3248.75	545.576
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer			1.318E-25						
Acetic Acid			2.812E-11	2.643E-06					
Aluminum Oxide	4.151E+03	9.202E+01							
Aldrin	***5.887E-01***	***1.305E-02***	***9.150E-03***	***3.584E+00***		***9.150E-03***		***9.150E-03***	***2.991E-03***
Aluminum Hydrogen EDTA	1.398E+03	3.100E+01							
Aluminum Hydroxide		7.799E+02							
Benzene	***1.163E-04***	***2.579E-06***	***3.784E+00***	***4.094E-01***		***3.784E+00***		***3.784E+00***	***3.775E+00***
Bis(2-ethylhexyl)phthalate (BEHP)	***2.352E+00***	***5.215E-02***	***3.377E-04***	***1.791E+00***		***3.377E-04***		***3.377E-04***	***1.127E-05***
Benzo(a)pyrene (BaP)	***1.923E-03***	***4.180E+00***							
Phenol	***4.125E+00***	***9.146E-02***	***1.045E-05***	***6.484E-03***		***1.045E-05***		***1.045E-05***	***6.855E-07***
Calcium Chloride Oxide									
Calcium Oxalate	4.037E+02	8.951E+00							
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Fluoride		1.536E+03							
Pentachlorophenol	***3.764E-01***	***8.346E-03***	***6.081E-03***	***3.808E+00***		***6.081E-03***		***6.081E-03***	***4.004E-04***
Hexachlorobenzene	***4.591E-03***	***4.183E+00***							
Chlorobenzene	***2.498E-04***	***5.539E-06***	***3.461E+00***	***7.293E-01***		***3.461E+00***		***3.461E+00***	***3.444E+00***
2-Chloronaphthalene	***7.759E-04***	***1.720E-05***	***2.132E+00***	***2.061E+00***		***2.132E+00***		***2.132E+00***	***2.087E+00***
Carbon Dioxide	7.727E+04	1.713E+03	2.307E-01	1.935E-02	3.897E+00	4.128E+00		4.128E+00	4.124E+00
Cesium Acetate	1.942E+02	4.306E+00							
Dibenz[a,h]anthracene	***4.092E+00***	***9.072E-02***	***7.586E-09***	***9.406E-03***		***7.586E-09***		***7.586E-09***	***1.333E-12***
1,2-dibromoethane	***5.994E-03***	***1.329E-04***	***1.492E+01***	***1.314E+01***		***1.492E+01***		***1.492E+01***	***1.462E+01***
Diethyl phthalate	***9.033E-01***	***2.003E-02***	***1.571E-03***	***3.283E+00***		***1.571E-03***		***1.571E-03***	***3.211E-05***
Iron (III) Chloride									
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA	3.314E+02	7.349E+00							
Iron (III) Hydroxide		8.318E+01							
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	1.115E+03	2.472E+01							
Water	1.850E+06	4.102E+04	5.877E+03	4.831E+06	3.638E+01	5.913E+03	4.536E+04	5.127E+04	2.574E+03
Sulfuric Acid									
Hydrogen Chloride	1.012E+04	2.244E+02	3.362E-20	6.020E-08					
Formic Acid	3.900E+02	8.647E+00	1.965E-13	2.927E-07					
Hydrofluoric Acid	3.011E+03	6.675E+01	8.251E-15	1.686E-07					
Mercury (II) Chloride									
Mercury (elemental)	5.708E-04	1.266E-05	7.786E+00	5.570E+01		7.786E+00		7.786E+00	3.408E+00
Mercury (II) Oxide	3.899E+01	2.951E+01		1.787E-07					
Nitrous (III) Acid	9.139E+04	2.026E+03	5.316E-07	8.500E-03		5.316E-07		5.316E-07	4.936E-09
Nitric Acid	6.278E+04	1.392E+03							
Hexachlorobutadiene	***1.109E-05***	***2.458E-07***	***4.170E+00***	***3.005E-02***		***4.170E+00***		***4.170E+00***	***4.169E+00***
Potassium Citrate	2.780E+03	6.164E+01							
Potassium Chloride	3.678E+04	8.155E+02							
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***1.805E-02***	***4.003E-04***	***2.494E-01***	***3.941E+00***		***2.494E-01***		***2.494E-01***	***1.866E-01***
4-methyl-2-pentanone (MIBK)	***2.779E-03***	***6.161E-05***	***9.808E-01***	***3.213E+00***		***9.808E-01***		***9.808E-01***	***9.121E-01***
Magnesium Oxalate	1.559E-02	3.457E-04							
Magnesium Dichromate (VI)									

Stream	UF1 Filtrate	UF1 Slurry	PC Vapor	PC Condensate	PC Control Air	PC Vap + CtrlAir	Super Steam 1	Stm Eject 1 Out	IC Vapor
Magnesium Hydroxide		2.385E+02							
Manganese (II) Oxalate	1.290E+00	2.860E-02							
Manganese (II) Hydroxide									
Nitrogen	5.729E-04	1.270E-05	2.968E+03	1.765E+00	5.940E+03	8.908E+03		8.908E+03	8.908E+03
Sodium Oxalate	5.317E+03	8.304E+03							
Sodium Chromate (VI)	8.222E+03	1.823E+02							
Sodium Acetate	1.807E+02	4.007E+00							
Sodium Glycolate	4.487E+03	9.948E+01							
Sodium Nitrite	7.168E+04	1.589E+03							
Sodium Hydroxide	3.444E+05	7.636E+03							
Naphthalene	***7.565E-04***	***1.677E-05***	***2.518E+00***	***1.670E+00***		***2.518E+00***		***2.518E+00***	***2.480E+00***
Sodium Aluminosilicate Gel		3.690E+03							
Nickel (II) Oxalate	3.890E+00	8.625E-02							
Oxygen	3.187E-04	7.067E-06	8.984E+02	1.002E+00	1.799E+03	2.697E+03		2.697E+03	2.697E+03
Phosphorus Pentoxide	6.294E+02	1.395E+01							
PYRENE	***1.593E-01***	***3.532E-03***	***4.456E-02***	***3.994E+00***		***4.456E-02***		***4.456E-02***	***2.353E-02***
Silicon Dioxide	8.596E+01	1.906E+00							
Sulfur Trioxide	4.676E+04	1.037E+03							
1,2,4-trichlorobenzene	***1.761E-04***	***3.904E-06***	***3.482E+00***	***7.110E-01***		***3.482E+00***		***3.482E+00***	***3.466E+00***
1,2,3-trichloropropane	***1.098E-03***	***2.435E-05***	***1.871E+00***	***2.327E+00***		***1.871E+00***		***1.871E+00***	***1.819E+00***
TOLUENE	***9.693E-05***	***2.149E-06***	***3.832E+00***	***3.620E-01***		***3.832E+00***		***3.832E+00***	***3.823E+00***
Zinc Dichloride Pentoxide									
Zinc Oxalate	1.122E+03	2.487E+01							
Zinc Hydroxide									
Zirconium EDTA	1.492E+01	3.308E-01							
Zirconium Oxide									
Total g/hr	2.625E+06	7.276E+04	9.793E+03	4.831E+06	7.779E+03	1.757E+04	4.536E+04	6.293E+04	1.423E+04
Volume, L/hr	2.152E+03	5.145E+01	1.146E+05	4.870E+03	6.613E+03	1.884E+05	4.866E+01	9.736E+04	5.017E+04
Enthalpy, cal/hr	-8.669E+09	-2.350E+08	-1.880E+07	-1.825E+10	-1.255E+05	-1.893E+07	-1.671E+08	-1.860E+08	-8.208E+06
Vapor fraction			1.000E+00		1.000E+00	1.000E+00		3.244E-01	1.000E+00
Solid fraction		3.622E-02		1.031E-06					
Organic fraction	1.997E-07	1.925E-07		1.115E-07					
Osmotic Pres, atm	1.739E+02	1.739E+02		1.628E-03				2.343E-03	
Redox Pot, volts									
E-Con, 1/ohm-cm				1.325E-07			1.478E-06	3.558E-07	
E-Con, cm2/ohm-mol				4.780E-03				3.550E-05	
Abs Visc, cP				6.536E-01			2.077E-01	4.792E-01	
Rel Visc				1.000E+00			1.000E+00	1.000E+00	
Ionic Strength	5.571E+00	5.571E+00		2.278E-07			1.250E-06	5.697E-07	

Table A-1. Waste Feed Evaporator Offgas Model Output for UF1 Filtrate Density of 1.22 g/ml (cont'd) [8]

Stream	IC Condensate	Super Steam 2	Stm Eject 2 Out	AC Vapor	AC Condensate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Phase	Mixed	Aqueous	Mixed	Vapor	Mixed	Mixed	Mixed	Mixed
Temperature, C	40	133	76.7327	40	40	40	40	25
Pressure, atm	0.279311	8.41674	0.837932	0.796018	0.796018	0.985242	0.985242	1
pH	6.10493	5.90373	6.02944		5.84094	5.7912	5.7912	6.70197
Total mol/hr	2703.18	2517.81	3063.39	443.532	2619.86	441.876	1.65655	273507
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer								
Acetic Acid								2.643E-06
Aluminum Oxide								
Aldrin	***6.159E-03***		***2.991E-03***	***3.956E-04***	***2.596E-03***	***3.558E-04***	***3.981E-05***	***3.593E+00***
Aluminum Hydrogen EDTA								
Aluminum Hydroxide								
Benzene	***9.395E-03***		***3.775E+00***	***3.743E+00***	***3.148E-02***	***3.743E+00***	***2.516E-05***	***4.503E-01***
Bis(2-ethylhexyl)phthalate (BEHP)	***3.264E-04***		***1.127E-05***	***1.264E-07***	***1.114E-05***	***1.051E-07***	***2.133E-08***	***1.791E+00***
Benzo(a)pyrene (BaP)								
Phenol	***9.769E-06***		***6.855E-07***	***1.396E-08***	***6.715E-07***	***1.351E-08***	***4.469E-10***	***6.495E-03***
Calcium Chloride Oxide								
Calcium Oxalate								
Calcium Oxalate Monohydrate								
Calcium Carbonate								
Calcium Dichromate (VI)								
Calcium Fluoride								
Pentachlorophenol	***5.681E-03***		***4.004E-04***	***8.221E-06***	***3.922E-04***	***7.845E-06***	***3.753E-07***	***3.814E+00***
Hexachlorobenzene								
Chlorobenzene	***1.668E-02***		***3.444E+00***	***3.389E+00***	***5.545E-02***	***3.389E+00***	***4.472E-05***	***8.015E-01***
2-Chloronaphthalene	***4.514E-02***		***2.087E+00***	***1.945E+00***	***1.420E-01***	***1.945E+00***	***2.217E-04***	***2.249E+00***
Carbon Dioxide	4.034E-03		4.124E+00	4.113E+00	1.117E-02	4.113E+00	8.645E-06	3.457E-02
Cesium Acetate								
Dibenz[a,h]anthracene	***7.568E-09***							***9.406E-03***
1,2-dibromoethane	***2.961E-01***		***1.462E+01***	***1.368E+01***	***9.366E-01***	***1.368E+01***	***7.478E-04***	***1.437E+01***
Diethyl phthalate	***1.538E-03***		***3.211E-05***	***1.984E-07***	***3.191E-05***	***1.829E-07***	***1.554E-08***	***3.284E+00***
Iron (III) Chloride								
Iron (III) Oxalate								
Iron (III) Hydrogen EDTA								
Iron (III) Hydroxide								
Formic Acid, dimer								
Hydrofluoride, dimer								
2,2'-Iminobisacetic acid								
Water	4.870E+04	4.536E+04	4.793E+04	7.369E+02	4.720E+04	7.071E+02	2.982E+01	4.927E+06
Sulfuric Acid								
Hydrogen Chloride								6.020E-08
Formic Acid								2.927E-07
Hydrofluoric Acid								1.686E-07
Mercury (II) Chloride								
Mercury (elemental)	4.378E+00		3.408E+00	9.732E-01	2.435E+00	7.715E-01	2.016E-01	6.271E+01
Mercury (II) Oxide								1.787E-07
Nitrous (III) Acid	5.266E-07		4.936E-09	2.498E-11	4.911E-09			8.501E-03
Nitric Acid								
Hexachlorobutadiene	***5.495E-04***		***4.169E+00***	***4.167E+00***	***1.850E-03***	***4.167E+00***	***6.590E-06***	***3.245E-02***
Potassium Citrate								
Potassium Chloride								
Potassium Glycolate								
Potassium Nitrate (VI)								
gamma-BHC (Lindane)	***6.275E-02***		***1.866E-01***	***8.759E-02***	***9.905E-02***	***8.739E-02***	***1.951E-04***	***4.103E+00***
4-methyl-2-pentanone (MIBK)	***6.870E-02***		***9.121E-01***	***7.271E-01***	***1.850E-01***	***7.269E-01***	***1.471E-04***	***3.467E+00***
Magnesium Oxalate								
Magnesium Dichromate (VI)								

Stream	IC Condensate	Super Steam 2	Stm Eject 2 Out	AC Vapor	AC Condensate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Magnesium Hydroxide								
Manganese (II) Oxalate								
Manganese (II) Hydroxide								
Nitrogen	1.220E-01		8.908E+03	8.907E+03	4.142E-01	8.907E+03	3.302E-04	2.302E+00
Sodium Oxalate								
Sodium Chromate (VI)								
Sodium Acetate								
Sodium Glycolate								
Sodium Nitrite								
Sodium Hydroxide								
Naphthalene	***3.753E-02***		***2.480E+00***	***2.360E+00***	***1.204E-01***	***2.360E+00***	***1.139E-04***	***1.828E+00***
Sodium Aluminosilicate Gel								
Nickel (II) Oxalate								
Oxygen	6.930E-02		2.697E+03	2.697E+03	2.352E-01	2.697E+03	1.875E-04	1.307E+00
Phosphorus Pentoxide								
PYRENE	***2.102E-02***		***2.354E-02***	***5.676E-03***	***1.786E-02***	***5.348E-03***	***3.289E-04***	***4.034E+00***
Silicon Dioxide								
Sulfur Trioxide								
1,2,4-trichlorobenzene	***1.587E-02***		***3.466E+00***	***3.413E+00***	***5.272E-02***	***3.413E+00***	***6.842E-05***	***7.797E-01***
1,2,3-trichloropropane	***5.197E-02***		***1.819E+00***	***1.659E+00***	***1.600E-01***	***1.659E+00***	***1.283E-04***	***2.539E+00***
TOLUENE	***8.303E-03***		***3.823E+00***	***3.796E+00***	***2.782E-02***	***3.796E+00***	***2.245E-05***	***3.981E-01***
Zinc Dichloride Pentoxide								
Zinc Oxalate								
Zinc Hydroxide								
Zirconium EDTA								
Zirconium Oxide								
Total g/hr	4.870E+04	4.536E+04	5.959E+04	1.239E+04	4.720E+04	1.236E+04	3.003E+01	4.927E+06
Volume, L/hr	4.909E+01	4.866E+01	2.700E+04	1.431E+04	4.758E+01	1.134E+04	3.008E-02	4.943E+03
Enthalpy, cal/hr	-1.839E+08	-1.671E+08	-1.753E+08	-2.326E+06	-1.783E+08	-2.301E+06	-1.126E+05	-1.868E+10
Vapor fraction			2.575E-01	1.000E+00		9.846E-01		
Solid fraction	8.070E-06				4.628E-06		6.067E-04	1.201E-06
Organic fraction	1.808E-08				2.098E-08	3.154E-08	2.052E-06	
Osmotic Pres, atm	5.558E-03		7.617E-03		1.841E-02	2.318E-02	2.318E-02	1.805E-03
Redox Pot, volts								
E-Con, 1/ohm-cm	3.791E-07	1.478E-06	6.648E-07		6.879E-07			8.678E-08
E-Con, cm2/ohm-mol	4.621E-05		6.945E-05		8.127E-05			6.196E-01
Abs Visc, cP	6.536E-01	2.077E-01	3.692E-01		6.536E-01			8.907E-01
Rel Visc	1.000E+00	1.000E+00	1.000E+00		1.000E+00			1.000E+00
Ionic Strength	7.863E-07	1.250E-06	9.357E-07		1.444E-06	1.620E-06	1.620E-06	1.988E-07

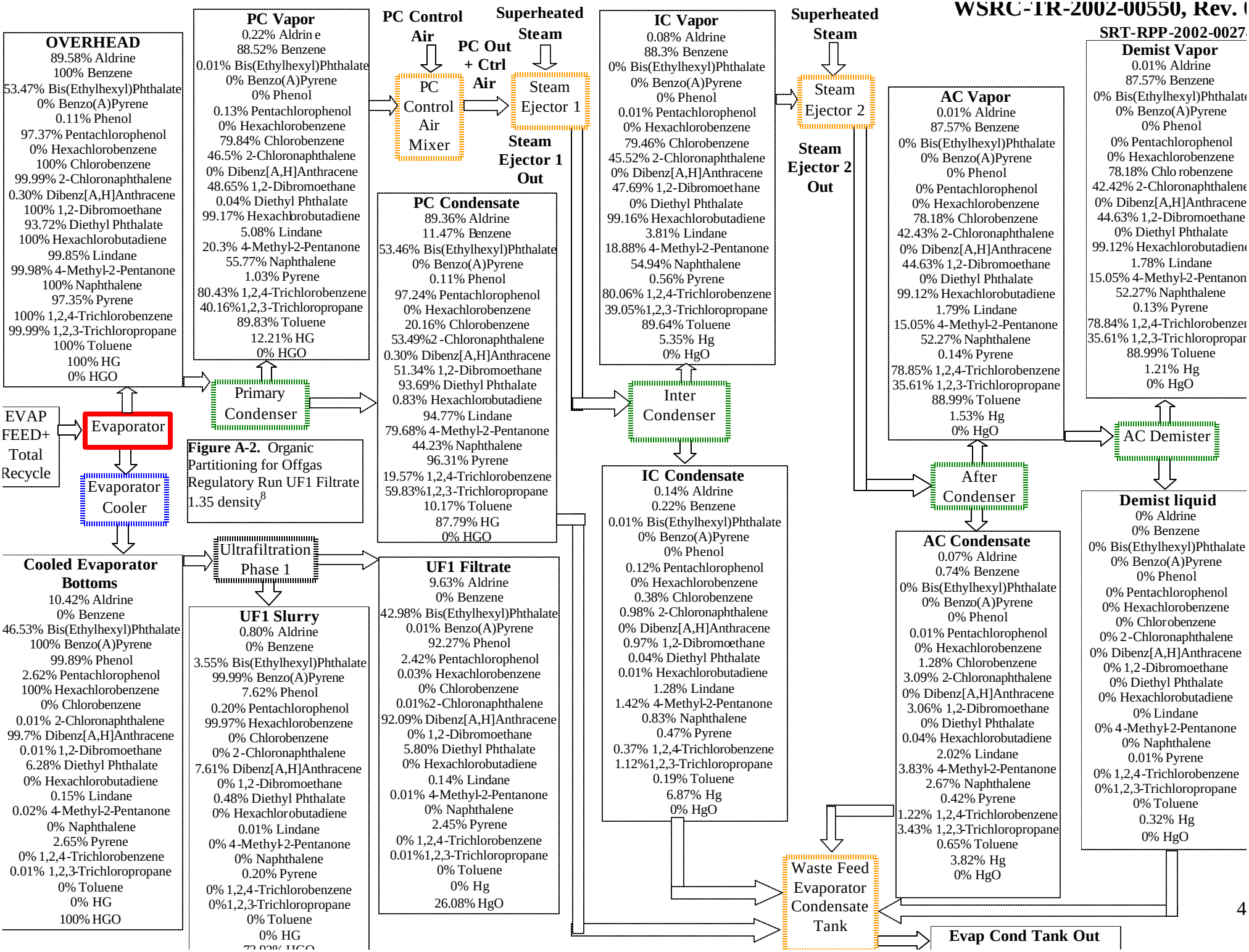


Figure A-2. Organic Partitioning for Offgas Regulatory Run UF1 Filtrate 1.35 density[8]

Table A- 2. Waste Feed Evaporator Offgas Model Output for UF1 Filtrate Density of 1.35 g/ml[8]

Stream	HLW OG Cond	Total Recycle	Evap Feed	EVAP REDRXN OUT	Air Inleakage	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott
Phase	Mixed	Mixed	Mixed	Mixed	Vapor	Mixed	Vapor	Mixed	Mixed
Temperature, C	25	25	25	50	25	50	50	50	25
Pressure, atm	1	1	1	0.108335	1	0.102137	0.102137	0.102137	1
pH	11.2694	12.8607	13.0705	12.6386		13.1314		13.1314	14.034
Total mol/hr	188132	7912.79	197463	393540	135.18	393679	321648	72031.1	71852.3
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer				1.584E-18		1.194E-18	1.194E-18		
Acetic Acid				2.804E-06		2.715E-06	2.715E-06		
Aluminum Oxide	1.231E+00	6.382E+01	2.657E+03	4.704E+03		4.740E+03		4.740E+03	4.737E+03
Aldrin		***7.204E-05***	***4.195E+00***	***4.195E+00***		***4.195E+00***	***3.758E+00***	***4.371E-01***	***4.371E-01***
Aluminum Hydrogen EDTA		1.727E+01	1.741E+03	1.209E+03		1.208E+03		1.208E+03	1.188E+03
Aluminum Hydroxide		4.775E+01	3.103E+03						
Benzene		***3.537E-07***	***4.194E+00***	***4.194E+00***		***4.194E+00***	***4.194E+00***	***2.807E-05***	***2.807E-05***
Bis(2-ethylhexyl)phthalate (BEHP)		***9.539E-04***	***4.193E+00***	***4.194E+00***		***4.194E+00***	***2.243E+00***	***1.952E+00***	***1.952E+00***
Benzo(a)pyrene (BaP)		***6.746E-06***	***4.181E+00***	***4.181E+00***		***4.181E+00***		***4.181E+00***	***4.181E+00***
Phenol		***5.364E-02***	***4.196E+00***	***4.249E+00***		***4.249E+00***	***4.512E-03***	***4.245E+00***	***4.245E+00***
Calcium Chloride Oxide	5.455E+02								
Calcium Oxalate	6.886E+00		6.736E+02	2.141E+02		3.096E+02		3.096E+02	6.266E+02
Calcium Oxalate Monohydrate	2.059E+00								
Calcium Carbonate		5.280E+00							
Calcium Citrate		1.867E+00							
Calcium Fluoride	5.358E+02		3.237E+02	1.660E+03		1.601E+03		1.601E+03	1.408E+03
Pentachlorophenol		***1.161E-03***	***4.196E+00***	***4.197E+00***		***4.197E+00***	***4.087E+00***	***1.102E-01***	***1.102E-01***
Hexachlorobenzene		***1.610E-05***	***4.188E+00***	***4.188E+00***		***4.188E+00***		***4.188E+00***	***4.188E+00***
Chlorobenzene		***7.586E-07***	***4.190E+00***	***4.190E+00***		***4.190E+00***	***4.190E+00***	***6.047E-05***	***6.047E-05***
2-Chloronaphthalene		***2.038E-06***	***4.194E+00***	***4.194E+00***		***4.194E+00***	***4.194E+00***	***2.439E-04***	***2.439E-04***
Carbon Dioxide		1.002E+03	7.847E+04	7.948E+04	1.949E+00	7.948E+04	5.045E-02	7.948E+04	7.948E+04
Cesium Acetate		2.524E+00	1.972E+02	1.998E+02		1.998E+02		1.998E+02	1.998E+02
Dibenz[a,h]anthracene		***5.199E-04***	***4.191E+00***	***4.191E+00***		***4.191E+00***	***1.244E-02***	***4.179E+00***	***4.179E+00***
1,2-dibromoethane		***1.823E-05***	***2.806E+01***	***2.806E+01***		***2.806E+01***	***2.806E+01***	***1.446E-03***	***1.446E-03***
Diethyl phthalate		***3.287E-03***	***4.202E+00***	***4.205E+00***		***4.205E+00***	***3.941E+00***	***2.639E-01***	***2.639E-01***
Iron (III) Chloride	1.159E+00								
Iron (III) Hydrogen EDTA		4.792E+00		5.994E+02		5.994E+02		5.994E+02	5.994E+02
Iron (III) Hydroxide	1.547E+02	2.866E+01							
Formic Acid, dimer				7.829E-25		6.209E-25	6.209E-25		
Hydrofluoride, dimer				2.203E-22		1.184E-22	1.184E-22		
2,2'-Iminobisacetic acid		1.449E+01	1.132E+03	1.147E+03		1.147E+03		1.147E+03	1.147E+03
Water	3.361E+06	1.371E+05	3.290E+06	6.789E+06	1.819E+01	6.790E+06	5.792E+06	9.977E+05	1.001E+06
Sulfuric Acid									
Hydrogen Chloride	1.862E+04	1.301E+02		1.041E+04		1.041E+04	4.263E-11	1.041E+04	1.041E+04
Formic Acid		5.069E+00	3.961E+02	4.011E+02		4.011E+02	3.091E-07	4.011E+02	4.011E+02
Hydrofluoric Acid	2.116E+01	2.471E+01	3.388E+03	3.023E+03		3.053E+03	1.450E-07	3.053E+03	1.345E+03
Mercury (II) Chloride				2.442E-07		1.603E-07	1.603E-07		
Mercury (elemental)		1.744E-06		6.374E+01		6.374E+01	6.374E+01	1.380E-04	1.380E-04
Mercury (II) Oxide		1.534E+00	1.361E+02	6.878E+01		6.878E+01		6.878E+01	6.878E+01
Nitrous (III) Acid	3.708E+03	4.828E+02	9.353E+04	9.653E+04		9.378E+04	6.469E-03	9.378E+04	9.331E+04
Nitric Acid	1.888E+03	4.675E+03	4.511E+04	6.653E+04		6.653E+04	3.522E-12	6.653E+04	6.653E+04
Hexachlorobutadiene		***1.590E-08***	***4.200E+00***	***4.200E+00***		***4.200E+00***	***4.200E+00***	***5.547E-06***	***5.547E-06***
Potassium Citrate		3.384E+01	2.823E+03	2.859E+03		2.859E+03		2.859E+03	2.859E+03
Potassium Chloride	1.845E+04	4.797E+02	1.350E+03	3.783E+04		3.783E+04		3.783E+04	3.783E+04
Potassium Nitrate (VI)			2.380E+04						
gamma-BHC (Lindane)		***4.442E-05***	***4.209E+00***	***4.209E+00***		***4.209E+00***	***4.203E+00***	***6.155E-03***	***6.155E-03***
4-methyl-2-pentanone (MIBK)		***8.460E-06***	***4.197E+00***	***4.197E+00***		***4.197E+00***	***4.196E+00***	***6.698E-04***	***6.698E-04***
Magnesium Oxalate	2.060E+00	1.488E-03		2.956E-02		1.704E-02		1.704E-02	2.043E-03
Magnesium Hydroxide	2.368E+02	1.301E+00		2.391E+02		2.391E+02		2.391E+02	2.392E+02
Manganese (II) Oxalate		2.485E-01		2.679E+00		2.679E+00		2.679E+00	2.679E+00
Manganese (II) Hydroxide		1.512E+00							

Stream	HLW OG Cond	Total Recycle	Evap Feed	EVAP REDRXN OUT	Air Inleakage	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott
Nitrogen		1.743E-06		1.743E-06	2.970E+03	2.970E+03	2.970E+03	1.379E-04	1.379E-04
Sodium Oxalate			1.433E+04	1.382E+04		1.372E+04		1.372E+04	1.339E+04
Sodium Chromate (VI)		1.069E+02	8.349E+03	8.456E+03		8.456E+03		8.456E+03	8.456E+03
Sodium Floride Sulfate									1.662E+04
Sodium Acetate		2.349E+00	1.835E+02	1.859E+02		1.859E+02		1.859E+02	1.859E+02
Sodium Glycolate		5.832E+01	4.556E+03	4.615E+03		4.615E+03		4.615E+03	4.615E+03
Sodium Nitrite	3.054E+03	1.966E+03	6.327E+04	7.001E+04		7.404E+04		7.404E+04	7.474E+04
Sodium Hydroxide	2.572E+04	6.114E+03	3.253E+05	3.563E+05		3.540E+05		3.540E+05	3.430E+05
Naphthalene		***2.243E-06***	***4.188E+00***	***4.188E+00***		***4.188E+00***	***4.188E+00***	***1.925E-04***	***1.925E-04***
Sodium Aluminosilicate Gel	2.920E+03	3.466E+02		3.894E+03		3.759E+03		3.759E+03	3.784E+03
Nickel (II) Oxalate		8.077E+00		8.077E+00		8.077E+00		8.077E+00	8.077E+00
Oxygen		9.698E-07		9.698E-07	8.994E+02	8.994E+02	8.995E+02	7.675E-05	7.675E-05
Phosphorus Pentoxide		8.180E+00	6.391E+02	6.473E+02		6.473E+02		6.473E+02	6.473E+02
PYRENE		***6.996E-05***	***4.202E+00***	***4.202E+00***		***4.202E+00***	***4.090E+00***	***1.115E-01***	***1.115E-01***
Silicon Dioxide	3.339E+02	3.496E+00		1.102E+02		1.589E+02		1.589E+02	1.502E+02
Sulfur Trioxide	5.781E+02	1.074E+02	4.702E+04	4.770E+04		4.770E+04		4.770E+04	4.047E+04
1,2,4-trichlorobenzene		***4.735E-07***	***4.193E+00***	***4.193E+00***		***4.193E+00***	***4.193E+00***	***5.306E-05***	***5.306E-05***
1,2,3-trichloropropane		***3.338E-06***	***4.198E+00***	***4.198E+00***		***4.198E+00***	***4.198E+00***	***2.657E-04***	***2.657E-04***
TOLUENE		***2.940E-07***	***4.194E+00***	***4.194E+00***		***4.194E+00***	***4.194E+00***	***2.351E-05***	***2.351E-05***
Zinc Dichloride Pentoxide	9.198E+00	5.119E+00							
Zinc Oxalate		5.908E+00		1.154E+03		1.154E+03		1.154E+03	1.154E+03
Zinc Hydroxide	7.281E+02								
Zirconium EDTA		7.440E-01		6.570E+00		7.143E+00		7.143E+00	3.098E+01
Zirconium Oxide		9.818E+00		7.926E+00		7.740E+00		7.740E+00	
Total g/hr	3.438E+06	1.528E+05	4.012E+06	7.603E+06	3.889E+03	7.607E+06	5.796E+06	1.811E+06	1.811E+06
Volume, L/hr	3.405E+03	1.436E+02	3.551E+03	6.703E+07	3.307E+03	8.341E+07	8.341E+07	1.368E+03	1.319E+03
Enthalpy, cal/hr	-1.289E+10	-5.506E+08	-1.404E+10	-2.450E+10	-6.275E+04	-2.402E+10	-1.852E+10	-5.498E+09	-5.522E+09
Vapor fraction				6.967E-01	1.000E+00	8.170E-01	1.000E+00		
Solid fraction	1.181E-04	1.707E-04	2.237E-04	1.349E-04		2.539E-04		1.387E-03	2.838E-03
Organic fraction		2.209E-10	4.886E-07	6.257E-08		5.873E-08		3.210E-07	3.139E-07
Osmotic Pres, atm	1.256E+01	4.822E+01	9.071E+01	1.801E+02		2.724E+02		2.724E+02	2.716E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.639E-02	9.183E-02	1.378E-01	2.765E-01		3.799E-01		3.799E-01	2.596E-01
E-Con, cm2/ohm-mol	9.004E+01	4.315E+01	6.830E+01	3.659E+01		3.077E+01		3.077E+01	2.052E+01
Abs Visc, cP	9.062E-01	1.063E+00	1.494E+00	1.449E+00		2.382E+00		2.382E+00	4.188E+00
Rel Visc	1.017E+00	1.194E+00	1.678E+00	2.648E+00		4.353E+00		4.353E+00	4.701E+00
Ionic Strength	2.815E-01	1.376E+00	3.062E+00	5.935E+00		1.052E+01		1.052E+01	9.970E+00

Table A- 2. Waste Feed Evaporator Offgas Model Output for UF1 Filtrate Density of 1.35 g/ml (cont'd)[8]

Stream	UF1 Filtrate	UF1 Slurry	PC Vapor	PC Condensate	PC Control Air	PC Vap + CtrlAir	Super Steam 1	Stm Eject 1 Out	IC Vapor
Phase	Mixed	Mixed	Vapor	Mixed	Vapor	Vapor	Aqueous	Mixed	Vapor
Temperature, C	25	25	40	40	25	34.7123	133	58.2382	40
Pressure, atm	1	1	0.103151	0.103151	1	0.0979798	8.41674	0.294007	0.279311
pH	14.034	14.034		6.72036			5.90373	6.25211	
Total mol/hr	66180.7	5671.62	460.449	321187	270.36	730.809	2517.81	3248.62	545.525
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer			6.816E-26						
Acetic Acid			2.022E-11	2.715E-06					
Aluminum Oxide	4.375E+03	3.615E+02							
Aldrin	***4.038E-01***	***3.336E-02***	***9.165E-03***	***3.749E+00***		***9.165E-03***		***9.165E-03***	***3.186E-03***
Aluminum Hydrogen EDTA	1.097E+03	9.067E+01							
Aluminum Hydroxide									
Benzene	***2.593E-05***	***2.142E-06***	***3.712E+00***	***4.812E-01***		***3.712E+00***		***3.712E+00***	***3.703E+00***
Bis(2-ethylhexyl)phthalate (BEHP)	***1.803E+00***	***1.489E-01***	***3.838E-04***	***2.242E+00***		***3.838E-04***		***3.838E-04***	***1.342E-05***
Benzo(a)pyrene (BaP)	***5.716E-04***	***4.181E+00***							
Phenol	***3.921E+00***	***3.239E-01***	***6.063E-06***	***4.506E-03***		***6.063E-06***		***6.063E-06***	***3.975E-07***
Calcium Chloride Oxide									
Calcium Oxalate	5.788E+02	4.782E+01							
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Citrate									
Calcium Fluoride		1.408E+03							
Pentachlorophenol	***1.018E-01***	***8.408E-03***	***5.461E-03***	***4.082E+00***		***5.461E-03***		***5.461E-03***	***3.598E-04***
Hexachlorobenzene	***1.364E-03***	***4.186E+00***							
Chlorobenzene	***5.586E-05***	***4.615E-06***	***3.346E+00***	***8.446E-01***		***3.346E+00***		***3.346E+00***	***3.330E+00***
2-Chloronaphthalene	***2.253E-04***	***1.861E-05***	***1.950E+00***	***2.244E+00***		***1.950E+00***		***1.950E+00***	***1.909E+00***
Carbon Dioxide	7.341E+04	6.065E+03	4.528E-02	5.170E-03	3.897E+00	3.942E+00		3.942E+00	3.939E+00
Cesium Acetate	1.845E+02	1.524E+01							
Dibenz[a,h]anthracene	***3.860E+00***	***3.189E-01***	***1.052E-08***	***1.244E-02***		***1.052E-08***		***1.052E-08***	***2.330E-12***
1,2-dibromoethane	***1.335E-03***	***1.103E-04***	***1.365E+01***	***1.441E+01***		***1.365E+01***		***1.365E+01***	***1.338E+01***
Diethyl phthalate	***2.438E-01***	***2.014E-02***	***1.574E-03***	***3.940E+00***		***1.574E-03***		***1.574E-03***	***3.217E-05***
Iron (III) Chloride									
Iron (III) Hydrogen EDTA	5.537E+02	4.574E+01							
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	1.059E+03	8.752E+01							
Water	9.246E+05	7.639E+04	5.875E+03	5.786E+06	3.638E+01	5.912E+03	4.536E+04	5.127E+04	2.574E+03
Sulfuric Acid									
Hydrogen Chloride	9.617E+03	7.945E+02	1.663E-23						
Formic Acid	3.705E+02	3.061E+01	1.449E-13	3.091E-07					
Hydrofluoric Acid	1.242E+03	1.026E+02	4.954E-15	1.450E-07					
Mercury (II) Chloride									
Mercury (elemental)	1.275E-04	1.053E-05	7.784E+00	5.596E+01		7.784E+00		7.784E+00	3.408E+00
Mercury (II) Oxide	1.794E+01	5.084E+01							
Nitrous (III) Acid	8.618E+04	7.120E+03	2.825E-07	6.469E-03		2.825E-07		2.825E-07	2.567E-09
Nitric Acid	6.145E+04	5.077E+03							
Hexachlorobutadiene	***5.123E-06***	***4.233E-07***	***4.165E+00***	***3.471E-02***		***4.165E+00***		***4.165E+00***	***4.164E+00***
Potassium Citrate	2.641E+03	2.182E+02							
Potassium Chloride	3.494E+04	2.887E+03							
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***5.685E-03***	***4.697E-04***	***2.139E-01***	***3.989E+00***		***2.139E-01***		***2.139E-01***	***1.602E-01***
4-methyl-2-pentanone (MIBK)	***6.187E-04***	***5.111E-05***	***8.521E-01***	***3.344E+00***		***8.521E-01***		***8.521E-01***	***7.924E-01***
Magnesium Oxalate	1.887E-03	1.559E-04							
Magnesium Hydroxide		2.392E+02							
Manganese (II) Oxalate	2.474E+00	2.044E-01							
Manganese (II) Hydroxide									
Nitrogen	1.274E-04	1.053E-05	2.968E+03	2.114E+00	5.940E+03	8.908E+03		8.908E+03	8.907E+03

Stream	UF1 Filtrate	UF1 Slurry	PC Vapor	PC Condensate	PC Control Air	PC Vap + CtrlAir	Super Steam 1	Stm Eject 1 Out	IC Vapor
Sodium Oxalate	1.480E+03	1.191E+04							
Sodium Chromate (VI)	7.811E+03	6.453E+02							
Sodium Floride Sulfate		1.662E+04							
Sodium Acetate	1.717E+02	1.418E+01							
Sodium Glycolate	4.263E+03	3.522E+02							
Sodium Nitrite	6.903E+04	5.703E+03							
Sodium Hydroxide	3.168E+05	2.617E+04							
Naphthalene	***1.779E-04***	***1.469E-05***	***2.336E+00***	***1.853E+00***		***2.336E+00***		***2.336E+00***	***2.301E+00***
Sodium Aluminosilicate Gel		3.784E+03							
Nickel (II) Oxalate	7.461E+00	6.164E-01							
Oxygen	7.090E-05	5.857E-06	8.982E+02	1.201E+00	1.799E+03	2.697E+03		2.697E+03	2.697E+03
Phosphorus Pentoxide	5.979E+02	4.940E+01							
PYRENE	***1.030E-01***	***8.513E-03***	***4.345E-02***	***4.047E+00***		***4.345E-02***		***4.345E-02***	***2.363E-02***
Silicon Dioxide	1.387E+02	1.146E+01							
Sulfur Trioxide	3.738E+04	3.088E+03							
1,2,4-trichlorobenzene	***4.902E-05***	***4.050E-06***	***3.372E+00***	***8.206E-01***		***3.372E+00***		***3.372E+00***	***3.357E+00***
1,2,3-trichloropropane	***2.454E-04***	***2.027E-05***	***1.686E+00***	***2.512E+00***		***1.686E+00***		***1.686E+00***	***1.639E+00***
TOLUENE	***2.172E-05***	***1.794E-06***	***3.767E+00***	***4.263E-01***		***3.767E+00***		***3.768E+00***	***3.759E+00***
Zinc Dichloride Pentoxide									
Zinc Oxalate	1.066E+03	8.805E+01							
Zinc Hydroxide									
Zirconium EDTA	2.861E+01	2.364E+00							
Zirconium Oxide									
Total g/hr	1.641E+06	1.695E+05	9.788E+03	5.786E+06	7.779E+03	1.757E+04	4.536E+04	6.293E+04	1.422E+04
Volume, L/hr	1.216E+03	1.039E+02	1.146E+05	5.833E+03	6.613E+03	1.884E+05	4.866E+01	9.735E+04	5.016E+04
Enthalpy, cal/hr	-5.017E+09	-5.049E+08	-1.879E+07	-2.186E+10	-1.255E+05	-1.892E+07	-1.671E+08	-1.860E+08	-8.207E+06
Vapor fraction			1.000E+00		1.000E+00	1.000E+00		3.244E-01	1.000E+00
Solid fraction		3.596E-02		8.637E-07					
Organic fraction	3.148E-07	3.035E-07		9.314E-08					
Osmotic Pres, atm	2.716E+02	2.716E+02		1.533E-03				2.291E-03	
Redox Pot, volts									
E-Con, 1/ohm-cm				1.189E-07			1.478E-06	3.510E-07	
E-Con, cm2/ohm-mol				5.139E-03				3.502E-05	
Abs Visc, cP				6.536E-01			2.077E-01	4.792E-01	
Rel Visc				1.000E+00			1.000E+00	1.000E+00	
Ionic Strength	9.970E+00	9.970E+00		1.905E-07			1.250E-06	5.602E-07	

Table A- 2. Waste Feed Evaporator Offgas Model Output for UF1 Filtrate Density of 1.35 g/ml (cont'd)[8]

Stream	IC Condensate	Super Steam 2	Stm Eject 2 Out	AC Vapor	AC Condensate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Phase	Mixed	Aqueous	Mixed	Vapor	Mixed	Mixed	Mixed	Mixed
Temperature, C	40	133	76.7334	40	40	40	40	25
Pressure, atm	0.279311	8.41674	0.837932	0.796018	0.796018	0.985242	0.985242	1
pH	6.11444	5.90373	6.03692		5.85076	5.80105	5.80105	6.82672
Total mol/hr	2703.1	2517.81	3063.34	443.492	2619.85	441.835	1.65736	326512
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer								
Acetic Acid								2.715E-06
Aluminum Oxide								
AIdrin	***5.979E-03***		***3.186E-03***	***4.442E-04***	***2.742E-03***	***4.009E-04***	***4.332E-05***	***3.757E+00***
Aluminum Hydrogen EDTA								
Aluminum Hydroxide								
Benzene	***9.217E-03***		***3.703E+00***	***3.672E+00***	***3.089E-02***	***3.672E+00***	***2.469E-05***	***5.213E-01***
Bis(2-ethylhexyl)phthalate (BEHP)	***3.704E-04***		***1.342E-05***	***1.541E-07***	***1.327E-05***	***1.282E-07***	***2.588E-08***	***2.243E+00***
Benzo(a)pyrene (BaP)								
Phenol	***5.665E-06***		***3.975E-07***	***8.095E-09***	***3.894E-07***	***7.836E-09***	***2.593E-10***	***4.512E-03***
Calcium Chloride Oxide								
Calcium Oxalate								
Calcium Oxalate Monohydrate								
Calcium Carbonate								
Calcium Citrate								
Calcium Fluoride								
Pentachlorophenol	***5.101E-03***		***3.598E-04***	***7.394E-06***	***3.524E-04***	***7.066E-06***	***3.279E-07***	***4.087E+00***
Hexachlorobenzene								
Chlorobenzene	***1.613E-02***		***3.330E+00***	***3.276E+00***	***5.361E-02***	***3.276E+00***	***4.321E-05***	***9.144E-01***
2-Chloronaphthalene	***4.123E-02***		***1.909E+00***	***1.779E+00***	***1.298E-01***	***1.779E+00***	***1.930E-04***	***2.415E+00***
Carbon Dioxide	3.887E-03		3.939E+00	3.928E+00	1.073E-02	3.928E+00	8.307E-06	1.980E-02
Cesium Acetate								
Dibenz[a,h]anthracene	***1.049E-08***							***1.244E-02***
1,2-dibromoethane	***2.710E-01***		***1.338E+01***	***1.253E+01***	***8.574E-01***	***1.253E+01***	***6.847E-04***	***1.554E+01***
Diethyl phthalate	***1.541E-03***		***3.217E-05***	***1.988E-07***	***3.198E-05***	***1.832E-07***	***1.556E-08***	***3.941E+00***
Iron (III) Chloride								
Iron (III) Hydrogen EDTA								
Iron (III) Hydroxide								
Formic Acid, dimer								
Hydrofluoride, dimer								
2,2'-Iminobisacetic acid								
Water	4.870E+04	4.536E+04	4.793E+04	7.368E+02	4.720E+04	7.070E+02	2.984E+01	5.882E+06
Sulfuric Acid								
Hydrogen Chloride								
Formic Acid								3.091E-07
Hydrofluoric Acid								1.450E-07
Mercury (II) Chloride								
Mercury (elemental)	4.376E+00		3.408E+00	9.731E-01	2.435E+00	7.715E-01	2.016E-01	6.297E+01
Mercury (II) Oxide								
Nitrous (III) Acid	2.799E-07		2.567E-09	1.270E-11	2.554E-09			6.469E-03
Nitric Acid								
Hexachlorobutadiene	***5.448E-04***		***4.164E+00***	***4.163E+00***	***1.838E-03***	***4.163E+00***	***6.208E-06***	***3.710E-02***
Potassium Citrate								
Potassium Chloride								
Potassium Nitrate (VI)								
gamma-BHC (Lindane)	***5.370E-02***		***1.602E-01***	***7.527E-02***	***8.493E-02***	***7.511E-02***	***1.596E-04***	***4.128E+00***
4-methyl-2-pentanone (MIBK)	***5.968E-02***		***7.924E-01***	***6.316E-01***	***1.607E-01***	***6.315E-01***	***1.279E-04***	***3.564E+00***
Magnesium Oxalate								
Magnesium Hydroxide								
Manganese (II) Oxalate								
Manganese (II) Hydroxide								
Nitrogen	1.220E-01		8.907E+03	8.907E+03	4.142E-01	8.907E+03	3.304E-04	2.651E+00

Stream	IC Condensate	Super Steam 2	Stm Eject 2 Out	AC Vapor	AC Condensate	Demist Vapor	Demist Liquid	Evap Cond Tk Out
Sodium Oxalate								
Sodium Chromate (VI)								
Sodium Floride Sulfate								
Sodium Acetate								
Sodium Glycolate								
Sodium Nitrite								
Sodium Hydroxide								
Naphthalene	***3.480E-02***		***2.301E+00***	***2.189E+00***	***1.117E-01***	***2.189E+00***	***1.042E-04***	***1.999E+00***
Sodium Aluminosilicate Gel								
Nickel (II) Oxalate								
Oxygen	6.930E-02		2.697E+03	2.697E+03	2.352E-01	2.697E+03	1.876E-04	1.505E+00
Phosphorus Pentoxide								
PYRENE	***1.982E-02***		***2.363E-02***	***5.929E-03***	***1.770E-02***	***5.607E-03***	***3.225E-04***	***4.085E+00***
Silicon Dioxide								
Sulfur Trioxide								
1,2,4-trichlorobenzene	***1.535E-02***		***3.357E+00***	***3.306E+00***	***5.101E-02***	***3.306E+00***	***6.398E-05***	***8.870E-01***
1,2,3-trichloropropane	***4.684E-02***		***1.639E+00***	***1.495E+00***	***1.442E-01***	***1.495E+00***	***1.156E-04***	***2.703E+00***
TOLUENE	***8.164E-03***		***3.759E+00***	***3.732E+00***	***2.736E-02***	***3.732E+00***	***2.206E-05***	***4.619E-01***
Zinc Dichloride Pentoxide								
Zinc Oxalate								
Zinc Hydroxide								
Zirconium EDTA								
Zirconium Oxide								
Total g/hr	4.870E+04	4.536E+04	5.958E+04	1.238E+04	4.720E+04	1.235E+04	3.004E+01	5.882E+06
Volume, L/hr	4.909E+01	4.866E+01	2.700E+04	1.431E+04	4.758E+01	1.134E+04	3.010E-02	5.901E+03
Enthalpy, cal/hr	-1.839E+08	-1.671E+08	-1.753E+08	-2.325E+06	-1.783E+08	-2.300E+06	-1.127E+05	-2.231E+10
Vapor fraction			2.575E-01	1.000E+00		9.846E-01		
Solid fraction	8.066E-06				4.628E-06		6.064E-04	1.008E-06
Organic fraction	1.441E-08				1.774E-08	2.873E-08	1.869E-06	
Osmotic Pres, atm	5.375E-03		7.518E-03		1.787E-02	2.250E-02	2.250E-02	1.671E-03
Redox Pot, volts								
E-Con, 1/ohm-cm	3.712E-07	1.478E-06	6.555E-07		6.726E-07			6.953E-08
E-Con, cm2/ohm-mol	4.525E-05		6.848E-05		7.948E-05			5.607E-01
Abs Visc, cP	6.536E-01	2.077E-01	3.692E-01		6.536E-01			8.907E-01
Rel Visc	1.000E+00	1.000E+00	1.000E+00		1.000E+00			1.000E+00
Ionic Strength	7.692E-07	1.250E-06	9.197E-07		1.412E-06	1.584E-06	1.584E-06	1.491E-07

6.0 APPENDIX B - DETAILED DESCRIPTION OF WASTE FEED EVAPORATOR OLI MODEL

This appendix describes in detail the 5-stage waste feed evaporator (FEP) OLI model used in the offgas regulatory modeling described in the main body of this report. The FEP model was used to generate the total recycle stream properties like flow rate and composition that were then used in the offgas regulatory runs described in the main body of this report. Figure B-1 shows an overview of the FEP OLI model with the Evaporator, Ultrafiltration Phase 1 & 2, and First & Second Caustic Washes, and Total Recycle. Note that the FEP model was driven by the density of the UF1 filtrate stream. Figure B-2 shows the first part of the Waste Feed Evaporator OLI Model: the Evaporator, Ultrafiltration Phase 1, and First & Second Caustic Wash Splits. Figure B-3 shows the second part of the Waste Feed Evaporator OLI Model: First Caustic Wash. The first caustic wash is broken into five phases FCW1-FCW5 to simulate multiple volume transfers. Only the first two caustic washes are shown. The other caustic washes are identical in the first caustic wash. Figure B-4 shows the last part of the Waste Feed Evaporator OLI Model: Leach, Ultrafiltration Phase 2, Caustic and Acid Rinse, Total Recycle, and Second Caustic Wash. Note that the second caustic wash is broken into five phases SCW1-SCW5 to simulate multiple volume transfers. Only the first phase is shown as the others are identical.

Table B- 1 shows the output of the FEP OLI model run for UF1 filtrate density of 1.22 g/ml. Table B- 2 shows the output from the FEP model run for UF1 filtrate density of 1.35 g/ml. Each of these runs took about 8 hours to converge on a 1.8 GHz PC. The lengthy run time was due to the large number of species (about 395) plus the density feedback control loop. Run time was significantly reduced by dropping the species CrOH3 or chromium hydroxide from the HLW Offgas Condensate (SBS Recycle) stream. In some cases the presence of Cr(OH)3 would cause the OLI model not to converge.

Figure B-1. Waste Feed Evaporator Model Overview: Evaporator, Ultrafiltration Phase 1 & 2, and First & Second Caustic Washes, and Total Recycle

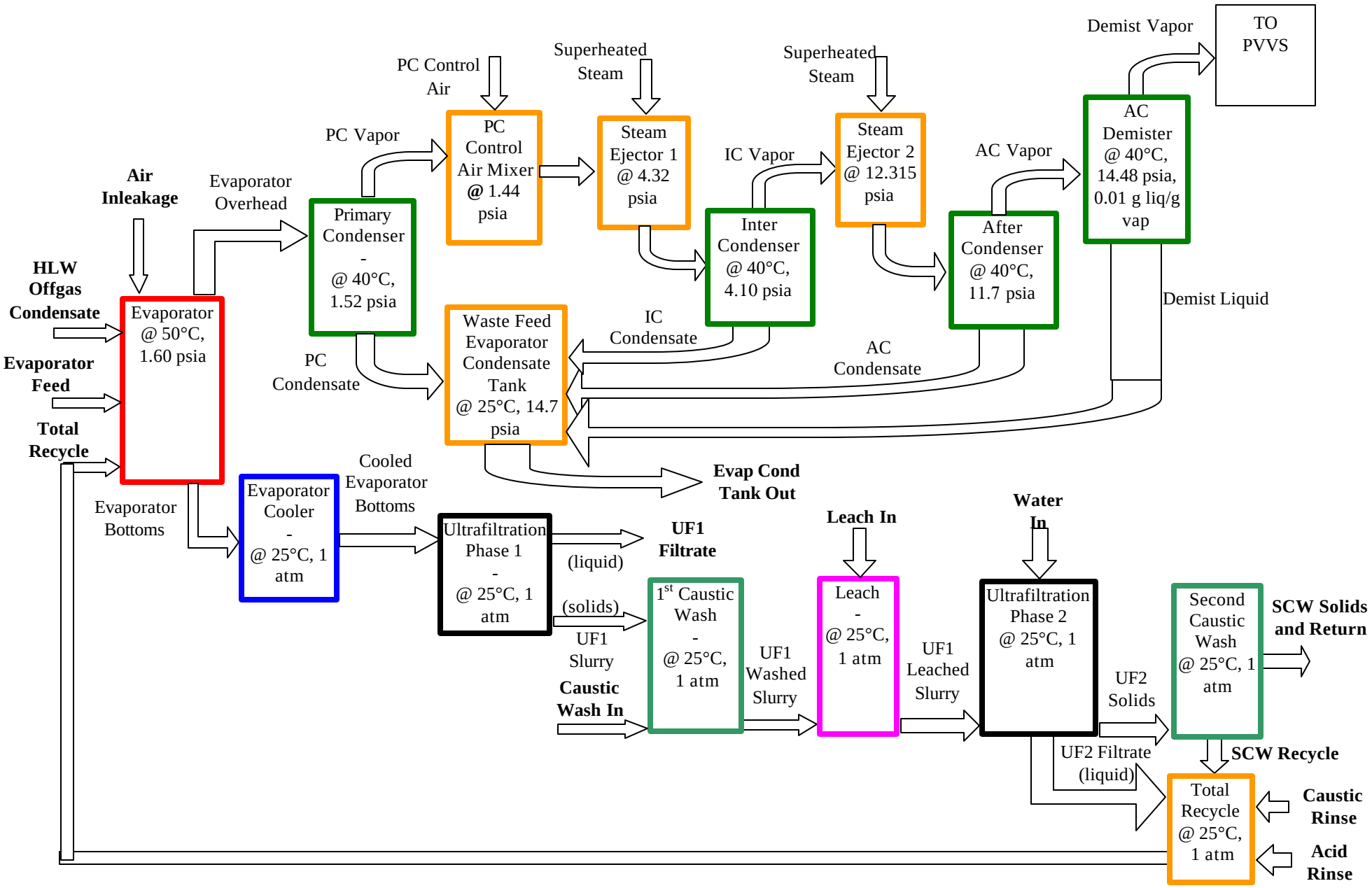


Figure B-2. Waste Feed Evaporator OLI Model Diagram - Evaporator, Ultrafiltration Phase 1, and First & Second Caustic Wash Splits

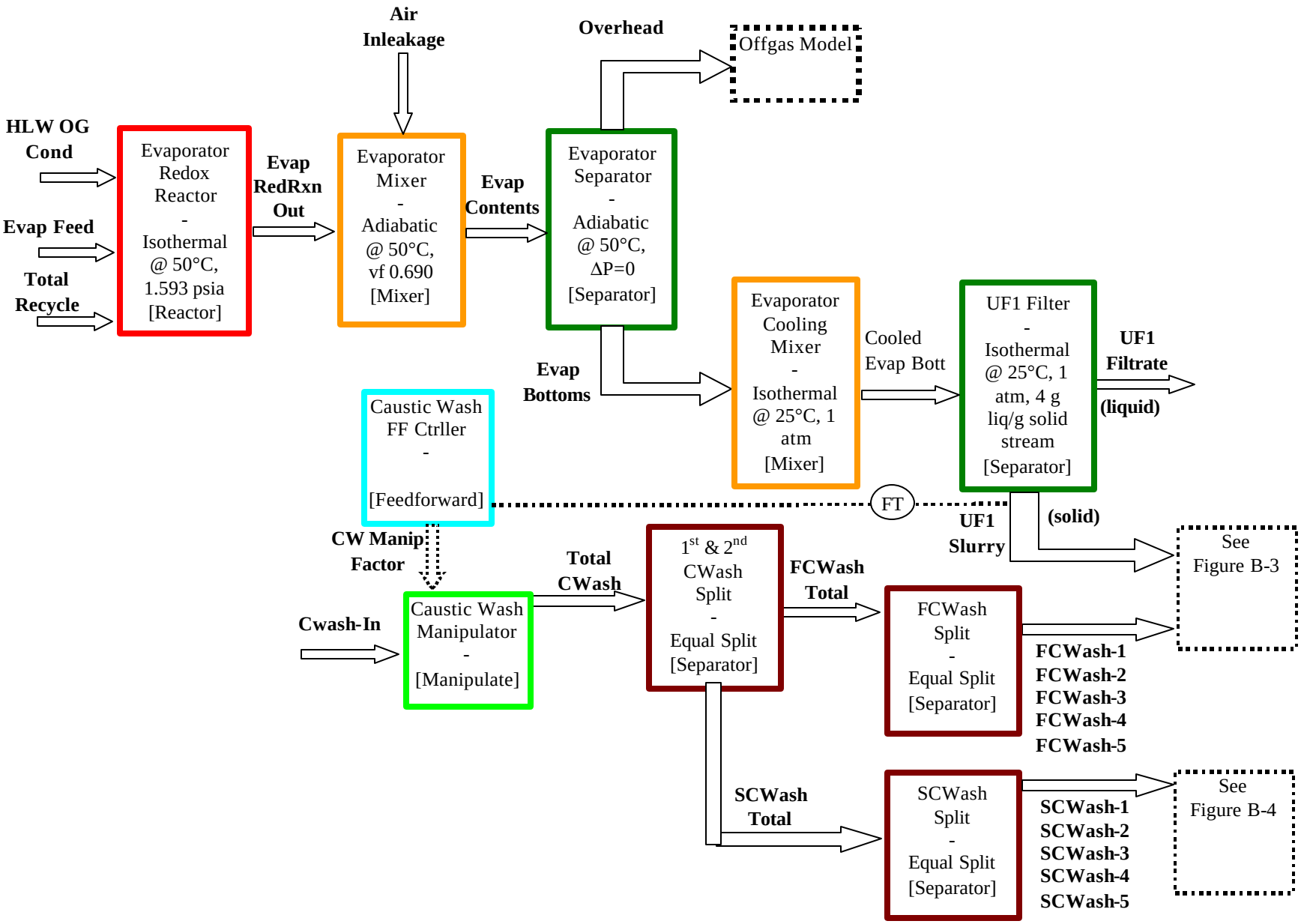
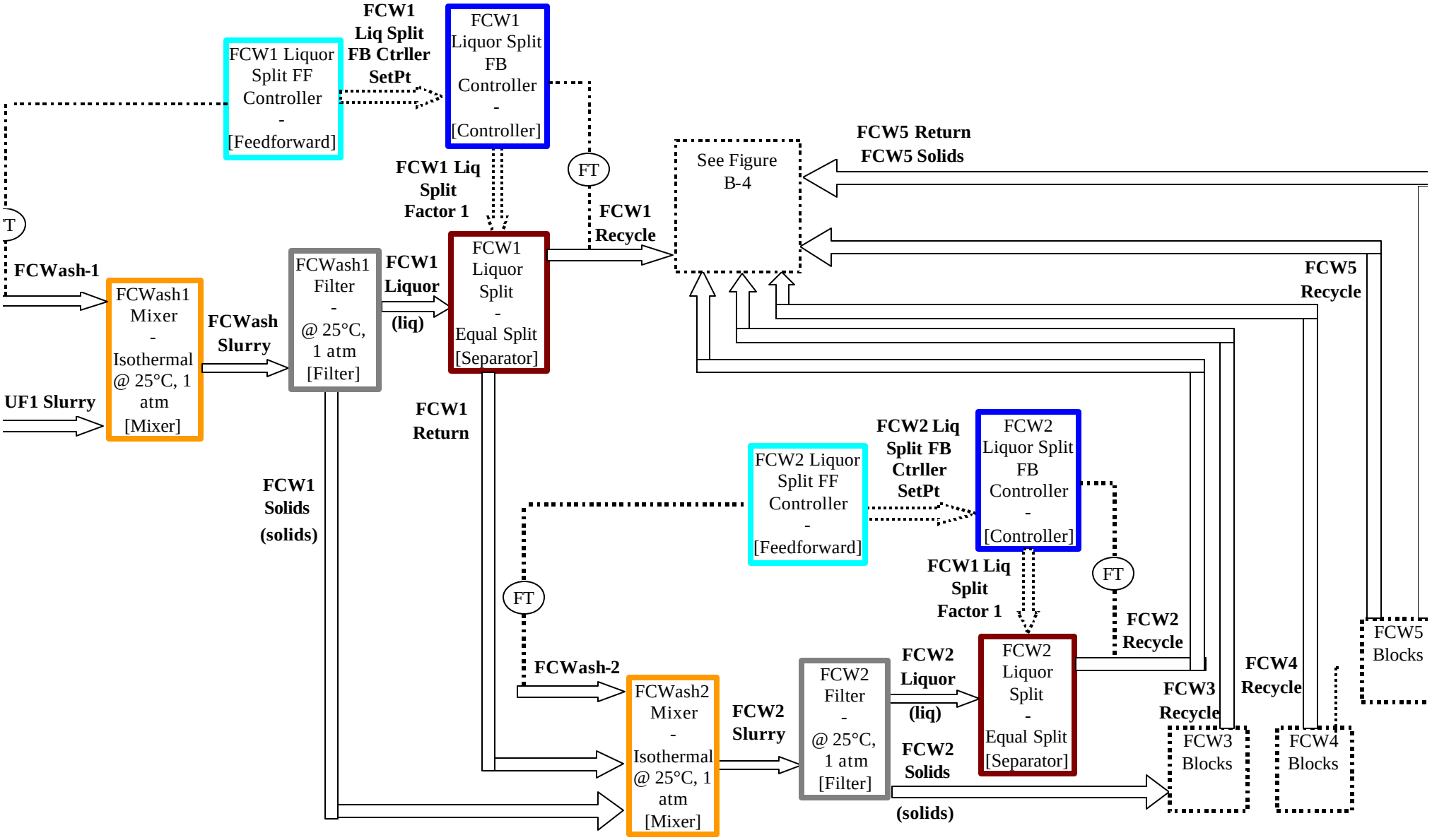


Figure B-3. Waste Feed Evaporator OLI Model Diagram - First Caustic Wash (Broken into 5 phases FCW1-FCW5 to simulate multiple volume transfers)



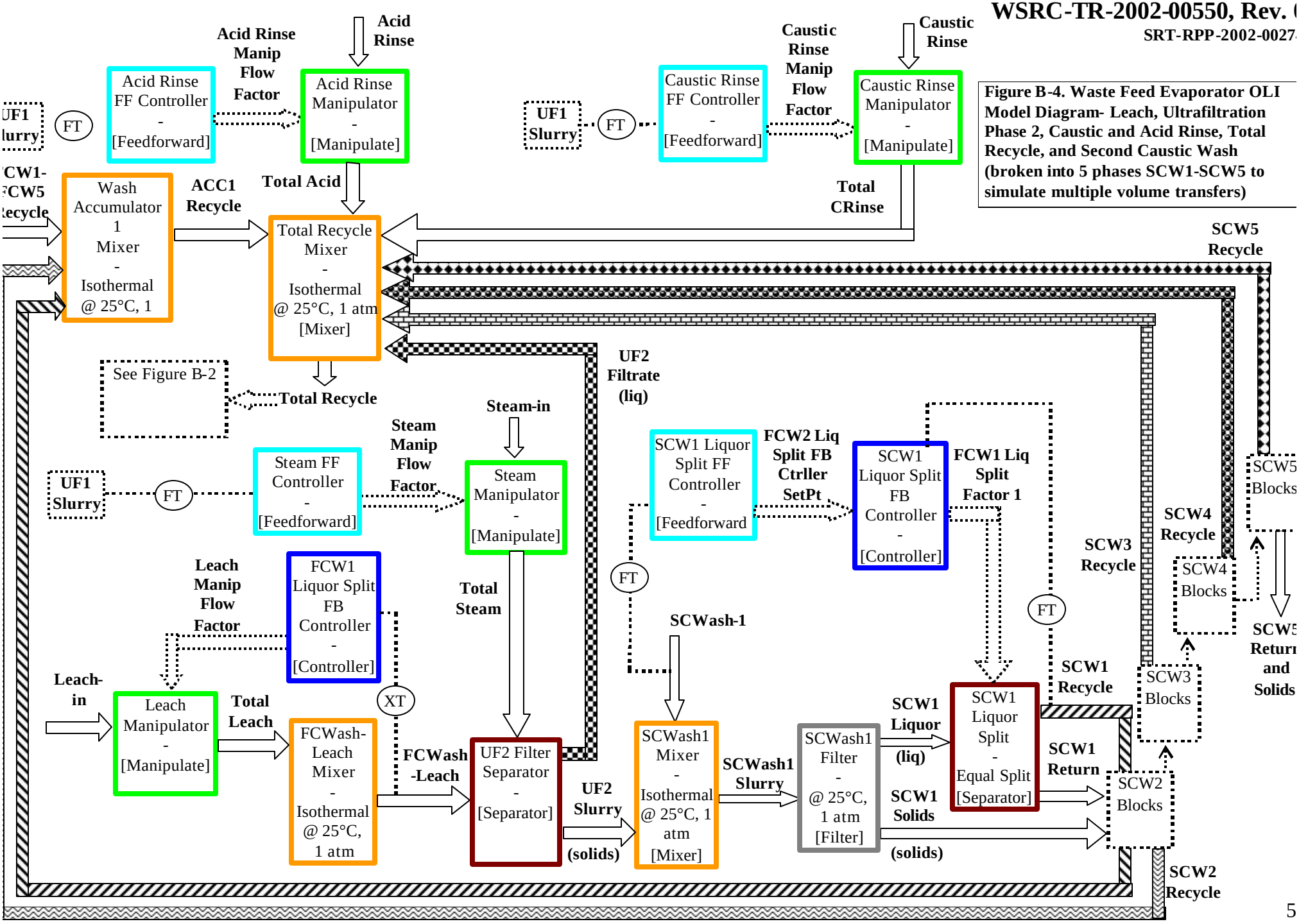


Figure B-4. Waste Feed Evaporator OLI Model Diagram- Leach, Ultrafiltration Phase 2, Caustic and Acid Rinse, Total Recycle, and Second Caustic Wash (broken into 5 phases SCW1-SCW5 to simulate multiple volume transfers)

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case[8]

Stream	Air Inleakage	EVAP REDRXN OUT	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott	UF1 Filtrate	UF1 Slurry
Phase	Vapor	Mixed	Mixed	Vapor	Mixed	Mixed	Aqueous	Mixed
Temperature, C	25	50	50	50	50	25	25	25
Pressure, atm	1	0.108335	0.108583	0.108583	0.108583	1	1	1
pH		12.6538	12.6388		12.6388	13.5083	13.5083	13.5083
Total mol/hr	135.18	390030	390165	268643	121522	121511	118779	2732.49
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer		1.430E-18	1.440E-18	1.440E-18				
Acetic Acid		2.647E-06	2.643E-06	2.643E-06				
Aluminum Oxide		4.810E+03	4.810E+03		4.810E+03	4.243E+03	4.150E+03	9.202E+01
Aldrin		***4.195E+00***	***4.195E+00***	***4.171E+00***	***2.408E-02***	***2.408E-02***	***2.355E-02***	***5.222E-04***
Aluminum Hydrogen EDTA		1.190E+03	1.190E+03		1.190E+03	1.429E+03	1.398E+03	3.100E+01
Aluminum Hydroxide						7.799E+02		7.799E+02
Benzene		***4.194E+00***	***4.194E+00***	***4.193E+00***	***1.188E-04***	***1.188E-04***	***1.162E-04***	***2.577E-06***
Bis(2-ethylhexyl)phthalate (BEHP)		***4.195E+00***	***4.195E+00***	***3.893E+00***	***3.026E-01***	***3.026E-01***	***2.960E-01***	***6.563E-03***
Benzo(a)pyrene (BaP)		***4.181E+00***	***4.181E+00***		***4.181E+00***	***4.181E+00***	***1.923E-03***	***4.180E+00***
Phenol		***4.223E+00***	***4.223E+00***	***6.495E-03***	***4.217E+00***	***4.217E+00***	***4.125E+00***	***9.146E-02***
Calcium Chloride Oxide								
Calcium Oxalate		2.279E+02	2.251E+02		2.251E+02	4.127E+02	4.037E+02	8.951E+00
Calcium Oxalate Monohydrate								
Calcium Carbonate								
Calcium Dichromate (VI)								
Calcium Fluoride		1.649E+03	1.651E+03		1.651E+03	1.536E+03		1.536E+03
Calcium Hydroxide								
Pentachlorophenol		***4.199E+00***	***4.199E+00***	***3.835E+00***	***3.641E-01***	***3.641E-01***	***3.562E-01***	***7.898E-03***
Hexachlorobenzene		***4.188E+00***	***4.188E+00***		***4.188E+00***	***4.188E+00***	***4.591E-03***	***4.183E+00***
Chlorobenzene		***4.190E+00***	***4.190E+00***	***4.190E+00***	***2.548E-04***	***2.548E-04***	***2.492E-04***	***5.526E-06***
2-Chloronaphthalene		***4.194E+00***	***4.194E+00***	***4.194E+00***	***6.844E-04***	***6.844E-04***	***6.696E-04***	***1.485E-05***
Carbon Dioxide	1.949E+00	7.899E+04	7.899E+04	2.500E-01	7.899E+04	7.899E+04	7.727E+04	1.713E+03
Cesium Acetate		1.985E+02	1.985E+02		1.985E+02	1.985E+02	1.942E+02	4.306E+00
Cesium Glycolate								
Dibenz[a,h]anthracene		***4.192E+00***	***4.192E+00***	***4.023E+00***	***1.691E-01***	***1.691E-01***	***1.655E-01***	***3.669E-03***
1,2-dibromoethane		***2.806E+01***	***2.806E+01***	***2.806E+01***	***6.123E-03***	***6.123E-03***	***5.990E-03***	***1.328E-04***
Diethyl phthalate		***4.208E+00***	***4.208E+00***	***3.288E+00***	***9.198E-01***	***9.198E-01***	***8.998E-01***	***1.995E-02***
Iron (III) Oxalate								
Iron (III) Citrate								
Iron (III) Hydrogen EDTA		6.074E+02	6.074E+02		6.074E+02	3.388E+02	3.314E+02	7.349E+00
Iron (III) Hydroxide						8.318E+01		8.318E+01
Formic Acid, dimer		7.040E-25	7.088E-25	7.088E-25				
Hydrofluoride, dimer		2.008E-22	2.039E-22	2.039E-22				
2,2'-Iminobisacetic acid		1.140E+03	1.140E+03		1.140E+03	1.140E+03	1.115E+03	2.472E+01
Water	1.819E+01	6.727E+06	6.727E+06	4.837E+06	1.890E+06	1.891E+06	1.850E+06	4.102E+04
Sulfuric Acid								
Hydrogen Chloride		1.035E+04	1.035E+04	4.604E-11	1.035E+04	1.035E+04	1.012E+04	2.244E+02
Formic Acid		3.987E+02	3.987E+02	2.927E-07	3.987E+02	3.987E+02	3.900E+02	8.647E+00
Hydrofluoric Acid		3.020E+03	3.019E+03	1.686E-07	3.019E+03	3.077E+03	3.011E+03	6.675E+01
Mercury (II) Chloride		***2.220E-07***	***2.240E-07***	***2.240E-07***				
Mercury (elemental)		***6.349E+01***	***6.349E+01***	***6.349E+01***	***5.835E-04***	***5.835E-04***	***5.708E-04***	***1.266E-05***
Mercury (II) Oxide		***6.850E+01***	***6.850E+01***		***6.850E+01***	***6.850E+01***	***3.899E+01***	***2.951E+01***
Nitrous (III) Acid		9.748E+04	9.766E+04	8.501E-03	9.766E+04	9.341E+04	9.139E+04	2.026E+03
Nitric Acid		6.417E+04	6.417E+04	1.712E-11	6.417E+04	6.417E+04	6.278E+04	1.392E+03
Hexachlorobutadiene		***4.200E+00***	***4.200E+00***	***4.200E+00***	***5.341E-06***	***5.341E-06***	***5.225E-06***	***1.158E-07***
Potassium Citrate		2.842E+03	2.842E+03		2.842E+03	2.842E+03	2.780E+03	6.164E+01

Stream	Air Inleakage	EVAP REDRXN OUT	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott	UF1 Filtrate	UF1 Slurry
Potassium Acetate								
Potassium Chloride		3.760E+04	3.760E+04		3.760E+04	3.760E+04	3.678E+04	8.155E+02
Potassium Glycolate								
Potassium Nitrate (VI)								
gamma-BHC (Lindane)		***4.209E+00***	***4.209E+00***	***4.194E+00***	***1.487E-02***	***1.487E-02***	***1.455E-02***	***3.226E-04***
4-methyl-2-pentanone (MIBK)		***4.197E+00***	***4.197E+00***	***4.194E+00***	***2.840E-03***	***2.840E-03***	***2.778E-03***	***6.160E-05***
Magnesium Oxalate		2.879E-02	2.947E-02		2.947E-02	1.594E-02	1.559E-02	3.457E-04
Magnesium Dichromate (VI)								
Magnesium Hydroxide		2.385E+02	2.385E+02		2.385E+02	2.385E+02		2.385E+02
Manganese (II) Orthophosphate								
Manganese (II) Oxalate		1.319E+00	1.319E+00		1.319E+00	1.319E+00	1.290E+00	2.860E-02
Manganese (II) Hydroxide								
Nitrogen	2.970E+03	3.815E-06	2.970E+03	2.970E+03	5.856E-04	5.856E-04	5.729E-04	1.270E-05
Sodium Oxalate		1.381E+04	1.382E+04		1.382E+04	1.362E+04	5.317E+03	8.304E+03
Sodium Chromate (VI)		8.404E+03	8.404E+03		8.404E+03	8.404E+03	8.222E+03	1.823E+02
Sodium Fluoride Sulfate								
Sodium Acetate		1.847E+02	1.847E+02		1.847E+02	1.847E+02	1.807E+02	4.007E+00
Sodium Glycolate		4.586E+03	4.586E+03		4.586E+03	4.586E+03	4.487E+03	9.948E+01
Sodium Nitrite		6.731E+04	6.704E+04		6.704E+04	7.327E+04	7.168E+04	1.589E+03
Sodium Hydroxide		3.554E+05	3.555E+05		3.555E+05	3.520E+05	3.444E+05	7.636E+03
Naphthalene		4.188E+00	4.188E+00	4.188E+00	7.531E-04	7.531E-04	7.368E-04	1.634E-05
Sodium Aluminosilicate Gel		3.617E+03	3.618E+03		3.618E+03	3.690E+03		3.690E+03
Nickel Orthophosphate								
Nickel (II) Oxalate		3.976E+00	3.976E+00		3.977E+00	3.976E+00	3.890E+00	8.625E-02
Nickel (II) Hydroxide								
Oxygen	8.994E+02	2.122E-06	8.994E+02	8.994E+02	3.258E-04	3.258E-04	3.187E-04	7.067E-06
Phosphorus Pentoxide		6.433E+02	6.433E+02		6.433E+02	6.433E+02	6.294E+02	1.395E+01
PYRENE		4.202E+00	4.202E+00	4.178E+00	2.339E-02	2.339E-02	2.288E-02	5.073E-04
Silicon Dioxide		1.142E+02	1.141E+02		1.141E+02	8.786E+01	8.596E+01	1.906E+00
Sulfur Trioxide		4.780E+04	4.780E+04		4.780E+04	4.780E+04	4.676E+04	1.037E+03
1,2,4-trichlorobenzene		4.193E+00	4.193E+00	4.193E+00	1.590E-04	1.590E-04	1.556E-04	3.449E-06
1,2,3-trichloropropane		4.198E+00	4.198E+00	4.197E+00	1.121E-03	1.121E-03	1.096E-03	2.431E-05
TOLUENE		4.194E+00	4.194E+00	4.194E+00	9.874E-05	9.874E-05	9.660E-05	2.142E-06
Zinc Dichloride Pentoxide								
Zinc Oxalate		1.147E+03	1.147E+03		1.147E+03	1.147E+03	1.122E+03	2.487E+01
Zinc Hydroxide								
Zirconium EDTA		6.821E+00	6.806E+00		6.806E+00	1.525E+01	1.492E+01	3.308E-01
Zirconium Oxide		2.737E+00	2.742E+00		2.742E+00			
Total g/hr	3.889E+03	7.535E+06	7.539E+06	4.841E+06	2.698E+06	2.698E+06	2.625E+06	7.276E+04
Volume, L/hr	3.307E+03	6.617E+07	6.552E+07	6.552E+07	2.252E+03	2.203E+03	2.152E+03	5.145E+01
Enthalpy, cal/hr	-6.275E+04	-2.430E+10	-2.432E+10	-1.547E+10	-8.855E+09	-8.904E+09	-8.669E+09	-2.350E+08
Vapor fraction	1.000E+00	6.940E-01	6.885E-01	1.000E+00				
Solid fraction		1.381E-04	1.316E-04		4.226E-04	8.146E-04		3.622E-02
Organic fraction								
Osmotic Pres, atm		1.802E+02	1.774E+02		1.774E+02	1.739E+02	1.739E+02	1.739E+02
Redox Pot, volts								
E-Con, 1/ohm-cm		3.040E-01	1.860E-01		1.860E-01	2.012E-01		
E-Con, cm2/ohm-mol		4.044E+01	2.497E+01		2.497E+01	2.663E+01		
Abs Visc, cP		1.444E+00	1.421E+00		1.421E+00	2.328E+00		
Rel Visc		2.639E+00	2.597E+00		2.597E+00	2.613E+00		
Ionic Strength		5.903E+00	5.791E+00		5.791E+00	5.571E+00	5.571E+00	5.571E+00

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	CWash-In	Total CWash	FCWash Total	SCWash Total	FCWash-1	FCWash-2	FCWash-3	FCWash-4	FCWash-5
Phase	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511
Total mol/hr	55.346	55.346	27.673	27.673	5.5346	5.5346	5.5346	5.5346	5.5346
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide									
Aldrin									
Aluminum Hydrogen EDTA									
Aluminum Hydroxide									
Benzene									
Bis(2-ethylhexyl)phthalate (BEHP)									
Benzo(a)pyrene (BaP)									
Phenol									
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Fluoride									
Calcium Hydroxide									
Pentachlorophenol									
Hexachlorobenzene									
Chlorobenzene									
2-Chloronaphthalene									
Carbon Dioxide									
Cesium Acetate									
Cesium Glycolate									
Dibenz[a,h]anthracene									
1,2-dibromoethane									
Diethyl phthalate									
Iron (III) Oxalate									
Iron (III) Citrate									
Iron (III) Hydrogen EDTA									
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid									
Water	9.969E+02	9.969E+02	4.984E+02	4.984E+02	9.969E+01	9.969E+01	9.969E+01	9.969E+01	9.969E+01
Sulfuric Acid									
Hydrogen Chloride									
Formic Acid									
Hydrofluoric Acid									
Mercury (II) Chloride									
Mercury (elemental)									
Mercury (II) Oxide									
Nitrous (III) Acid									
Nitric Acid									
Hexachlorobutadiene									
Potassium Citrate									
Potassium Acetate									
Potassium Chloride									

Stream	CWash-In	Total CWash	FCWash Total	SCWash Total	FCWash-1	FCWash-2	FCWash-3	FCWash-4	FCWash-5
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)									
4-methyl-2-pentanone (MIBK)									
Magnesium Oxalate									
Magnesium Dichromate (VI)									
Magnesium Hydroxide									
Manganese (II) Orthophosphate									
Manganese (II) Oxalate									
Manganese (II) Hydroxide									
Nitrogen									
Sodium Oxalate									
Sodium Chromate (VI)									
Sodium Fluoride Sulfate									
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide	3.999E-01	3.999E-01	1.999E-01	1.999E-01	3.999E-02	3.999E-02	3.999E-02	3.999E-02	3.999E-02
Naphthalene									
Sodium Aluminosilicate Gel									
Nickel Orthophosphate									
Nickel (II) Oxalate									
Nickel (II) Hydroxide									
Oxygen									
Phosphorus Pentoxide									
PYRENE									
Silicon Dioxide									
Sulfur Trioxide									
1,2,4-trichlorobenzene									
1,2,3-trichloropropane									
TOLUENE									
Zinc Dichloride Pentoxide									
Zinc Oxalate									
Zinc Hydroxide									
Zirconium EDTA									
Zirconium Oxide									
Total g/hr	9.973E+02	9.973E+02	4.986E+02	4.986E+02	9.973E+01	9.973E+01	9.973E+01	9.973E+01	9.973E+01
Volume, L/hr	1.000E+00	1.000E+00	5.000E-01	5.000E-01	1.000E-01	1.000E-01	1.000E-01	1.000E-01	1.000E-01
Enthalpy, cal/hr	-3.781E+06	-3.781E+06	-1.891E+06	-1.891E+06	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05
Vapor fraction									
Solid fraction									
Organic fraction									
Osmotic Pres, atm	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01
Redox Pot, volts									
E-Con, 1/ohm-cm	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03
E-Con, cm2/ohm-mol	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02
Abs Visc, cP	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01
Rel Visc	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00
Ionic Strength	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	SCWash-1	SCWash-2	SCWash-3	SCWash-4	SCWash-5	FCWash Slurry	FCW1 Liquor	FCW1 Solids	FCW1 Recycle
Phase	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	11.9511	11.9511	11.9511	11.9511	11.9511	13.5065	13.5065		13.5065
Total mol/hr	5.5346	5.5346	5.5346	5.5346	5.5346	2738.02	2639.05	98.977	5.52038
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide						9.190E+01	9.190E+01		1.922E-01
Aldrin						***5.222E-04***	***5.222E-04***		***1.092E-06***
Aluminum Hydrogen EDTA						3.101E+01	3.101E+01		6.487E-02
Aluminum Hydroxide						7.800E+02		7.800E+02	
Benzene						***2.577E-06***	***2.577E-06***		***5.390E-09***
Bis(2-ethylhexyl)phthalate (BEHP)						***6.563E-03***	***6.563E-03***		***1.373E-05***
Benzo(a)pyrene (BaP)						***4.180E+00***	***4.281E-05***	***4.179E+00***	***8.955E-08***
Phenol						***9.146E-02***	***9.146E-02***		***1.913E-04***
Calcium Chloride Oxide									
Calcium Oxalate						8.946E+00	8.946E+00		1.871E-02
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Fluoride						1.536E+03		1.536E+03	
Calcium Hydroxide									
Pentachlorophenol						***7.898E-03***	***7.898E-03***		***1.652E-05***
Hexachlorobenzene						***4.183E+00***	***1.022E-04***	***4.183E+00***	***2.138E-07***
Chlorobenzene						***5.526E-06***	***5.526E-06***		***1.156E-08***
2-Chloronaphthalene						***1.485E-05***	***1.485E-05***		***3.105E-08***
Carbon Dioxide						1.713E+03	1.713E+03		3.584E+00
Cesium Acetate						4.306E+00	4.306E+00		9.007E-03
Cesium Glycolate									
Dibenz[a,h]anthracene						***3.669E-03***	***3.669E-03***		***7.674E-06***
1,2-dibromoethane						***1.328E-04***	***1.328E-04***		***2.778E-07***
Diethyl phthalate						***1.995E-02***	***1.995E-02***		***4.173E-05***
Iron (III) Oxalate									
Iron (III) Citrate									
Iron (III) Hydrogen EDTA						7.335E+00	7.335E+00		1.534E-02
Iron (III) Hydroxide						8.319E+01		8.319E+01	
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid						2.472E+01	2.472E+01		5.171E-02
Water	9.969E+01	9.969E+01	9.969E+01	9.969E+01	9.969E+01	4.112E+04	4.112E+04		8.602E+01
Sulfuric Acid									
Hydrogen Chloride						2.244E+02	2.244E+02		4.695E-01
Formic Acid						8.647E+00	8.647E+00		1.809E-02
Hydrofluoric Acid						6.675E+01	6.675E+01		1.396E-01
Mercury (II) Chloride									
Mercury (elemental)						***1.266E-05***	***1.266E-05***		***2.647E-08***
Mercury (II) Oxide						***2.951E+01***	***8.674E-01***	***2.865E+01***	***1.814E-03***
Nitrous (III) Acid						2.027E+03	2.027E+03		4.239E+00
Nitric Acid						1.392E+03	1.392E+03		2.911E+00
Hexachlorobutadiene						***1.158E-07***	***1.158E-07***		***2.423E-10***
Potassium Citrate						6.164E+01	6.164E+01		1.289E-01
Potassium Acetate									
Potassium Chloride						8.155E+02	8.155E+02		1.706E+00

Stream	SCWash-1	SCWash-2	SCWash-3	SCWash-4	SCWash-5	FCWash Slurry	FCW1 Liquor	FCW1 Solids	FCW1 Recycle
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)						***3.226E-04***	***3.226E-04***		***6.748E-07***
4-methyl-2-pentanone (MIBK)						***6.160E-05***	***6.160E-05***		***1.288E-07***
Magnesium Oxalate						3.468E-04	3.468E-04		7.253E-07
Magnesium Dichromate (VI)									
Magnesium Hydroxide						2.385E+02		2.385E+02	
Manganese (II) Orthophosphate									
Manganese (II) Oxalate						2.860E-02	2.860E-02		5.983E-05
Manganese (II) Hydroxide									
Nitrogen						1.270E-05	1.270E-05		2.657E-08
Sodium Oxalate						8.304E+03	1.184E+02	8.186E+03	2.477E-01
Sodium Chromate (VI)						1.823E+02	1.823E+02		3.813E-01
Sodium Fluoride Sulfate									
Sodium Acetate						4.007E+00	4.007E+00		8.381E-03
Sodium Glycolate						9.948E+01	9.948E+01		2.081E-01
Sodium Nitrite						1.589E+03	1.589E+03		3.324E+00
Sodium Hydroxide	3.999E-02	3.999E-02	3.999E-02	3.999E-02	3.999E-02	7.636E+03	7.636E+03		1.597E+01
Naphthalene						1.634E-05	1.634E-05		3.417E-08
Sodium Aluminosilicate Gel						3.690E+03		3.690E+03	
Nickel Orthophosphate									
Nickel (II) Oxalate						8.625E-02	8.625E-02		1.804E-04
Nickel (II) Hydroxide									
Oxygen						7.067E-06	7.067E-06		1.478E-08
Phosphorus Pentoxide						1.395E+01	1.395E+01		2.919E-02
PYRENE						5.073E-04	5.073E-04		1.061E-06
Silicon Dioxide						1.906E+00	1.906E+00		3.988E-03
Sulfur Trioxide						1.037E+03	1.037E+03		2.169E+00
1,2,4-trichlorobenzene						3.449E-06	3.449E-06		7.215E-09
1,2,3-trichloropropane						2.431E-05	2.431E-05		5.085E-08
TOLUENE						2.142E-06	2.142E-06		4.480E-09
Zinc Dichloride Pentoxide									
Zinc Oxalate						2.487E+01	2.487E+01		5.203E-02
Zinc Hydroxide									
Zirconium EDTA						3.308E-01	3.308E-01		6.919E-04
Zirconium Oxide									
Total g/hr	9.973E+01	9.973E+01	9.973E+01	9.973E+01	9.973E+01	7.286E+04	5.831E+04	1.455E+04	1.220E+02
Volume, L/hr	1.000E-01	1.000E-01	1.000E-01	1.000E-01	1.000E-01	5.155E+01	4.781E+01	3.741E+00	1.000E-01
Enthalpy, cal/hr	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05	-2.354E+08	-1.926E+08	-4.284E+07	-4.028E+05
Vapor fraction									
Solid fraction						3.615E-02		1.000E+00	
Organic fraction									
Osmotic Pres, atm	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	1.736E+02	1.736E+02		1.736E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.010E-01	2.010E-01		2.010E-01
E-Con, cm2/ohm-mol	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.110E+01	2.110E+01		2.110E+01
Abs Visc, cP	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	2.323E+00	2.323E+00		2.323E+00
Rel Visc	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	2.608E+00	2.608E+00		2.608E+00
Ionic Strength	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	5.558E+00	5.558E+00		5.558E+00

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	FCW1 Return	FCW2 Slurry	FCW2 Liquor	FCW2 Solids	FCW2 Recycle	FCW2 Return	FCW3 Slurry	FCW3 Liquor	FCW3 Solids
Phase	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous	Solid
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	13.5065	13.5047	13.5047		13.5047	13.5047	13.5029	13.5029	
Total mol/hr	2633.53	2738.03	2639.06	98.9753	5.52057	2633.54	2738.05	2639.07	98.9737
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide	9.171E+01	9.159E+01	9.159E+01		1.916E-01	9.140E+01	9.128E+01	9.128E+01	
Aldrin	***5.211E-04***	***5.211E-04***	***5.211E-04***		***1.090E-06***	***5.200E-04***	***5.200E-04***	***5.200E-04***	
Aluminum Hydrogen EDTA	3.095E+01	3.096E+01	3.096E+01		6.477E-02	3.090E+01	3.091E+01	3.091E+01	
Aluminum Hydroxide		7.802E+02		7.802E+02			7.804E+02		7.804E+02
Benzene	***2.571E-06***	***2.571E-06***	***2.571E-06***		***5.378E-09***	***2.566E-06***	***2.566E-06***	***2.566E-06***	
Bis(2-ethylhexyl)phthalate (BEHP)	***6.549E-03***	***6.549E-03***	***6.549E-03***		***1.370E-05***	***6.535E-03***	***6.535E-03***	***6.535E-03***	
Benzo(a)pyrene (BaP)	***4.272E-05***	***4.180E+00***	***4.289E-05***	***4.179E+00***	***8.971E-08***	***4.280E-05***	***4.180E+00***	***4.297E-05***	***4.179E+00***
Phenol	***9.127E-02***	***9.127E-02***	***9.127E-02***		***1.909E-04***	***9.108E-02***	***9.108E-02***	***9.108E-02***	
Calcium Chloride Oxide									
Calcium Oxalate	8.927E+00	8.922E+00	8.922E+00		1.866E-02	8.903E+00	8.898E+00	8.898E+00	
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Fluoride		1.536E+03		1.536E+03			1.536E+03		1.536E+03
Calcium Hydroxide									
Pentachlorophenol	***7.881E-03***	***7.881E-03***	***7.881E-03***		***1.649E-05***	***7.865E-03***	***7.865E-03***	***7.865E-03***	
Hexachlorobenzene	***1.020E-04***	***4.183E+00***	***1.024E-04***	***4.183E+00***	***2.142E-07***	***1.022E-04***	***4.183E+00***	***1.026E-04***	***4.183E+00***
Chlorobenzene	***5.515E-06***	***5.515E-06***	***5.515E-06***		***1.154E-08***	***5.503E-06***	***5.503E-06***	***5.503E-06***	
2-Chloronaphthalene	***1.481E-05***	***1.481E-05***	***1.481E-05***		***3.099E-08***	***1.478E-05***	***1.478E-05***	***1.478E-05***	
Carbon Dioxide	1.710E+03	1.710E+03	1.710E+03		3.576E+00	1.706E+03	1.706E+03	1.706E+03	
Cesium Acetate	4.297E+00	4.297E+00	4.297E+00		8.989E-03	4.288E+00	4.288E+00	4.288E+00	
Cesium Glycolate									
Dibenz[a,h]anthracene	***3.661E-03***	***3.661E-03***	***3.661E-03***		***7.658E-06***	***3.653E-03***	***3.653E-03***	***3.653E-03***	
1,2-dibromoethane	***1.325E-04***	***1.325E-04***	***1.325E-04***		***2.772E-07***	***1.323E-04***	***1.323E-04***	***1.323E-04***	
Diethyl phthalate	***1.991E-02***	***1.991E-02***	***1.991E-02***		***4.165E-05***	***1.987E-02***	***1.987E-02***	***1.987E-02***	
Iron (III) Oxalate									
Iron (III) Citrate									
Iron (III) Hydrogen EDTA	7.320E+00	7.306E+00	7.306E+00		1.528E-02	7.291E+00	7.278E+00	7.278E+00	
Iron (III) Hydroxide		8.319E+01		8.319E+01			8.320E+01		8.320E+01
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	2.467E+01	2.467E+01	2.467E+01		5.161E-02	2.462E+01	2.462E+01	2.462E+01	
Water	4.103E+04	4.113E+04	4.113E+04		8.605E+01	4.105E+04	4.115E+04	4.115E+04	
Sulfuric Acid									
Hydrogen Chloride	2.240E+02	2.240E+02	2.240E+02		4.685E-01	2.235E+02	2.235E+02	2.235E+02	
Formic Acid	8.629E+00	8.629E+00	8.629E+00		1.805E-02	8.611E+00	8.611E+00	8.611E+00	
Hydrofluoric Acid	6.661E+01	6.661E+01	6.661E+01		1.393E-01	6.647E+01	6.647E+01	6.647E+01	
Mercury (II) Chloride									
Mercury (elemental)	***1.263E-05***	***1.263E-05***	***1.263E-05***		***2.642E-08***	***1.260E-05***	***1.260E-05***	***1.260E-05***	
Mercury (II) Oxide	***8.655E-01***	***2.951E+01***	***8.685E-01***	***2.864E+01***	***1.817E-03***	***8.667E-01***	***2.951E+01***	***8.696E-01***	***2.864E+01***
Nitrous (III) Acid	2.022E+03	2.023E+03	2.023E+03		4.231E+00	2.018E+03	2.019E+03	2.019E+03	
Nitric Acid	1.389E+03	1.389E+03	1.389E+03		2.905E+00	1.386E+03	1.386E+03	1.386E+03	
Hexachlorobutadiene	***1.156E-07***	***1.156E-07***	***1.156E-07***		***2.418E-10***	***1.154E-07***	***1.154E-07***	***1.154E-07***	
Potassium Citrate	6.151E+01	6.151E+01	6.151E+01		1.287E-01	6.138E+01	6.138E+01	6.138E+01	
Potassium Acetate									
Potassium Chloride	8.138E+02	8.138E+02	8.138E+02		1.702E+00	8.121E+02	8.121E+02	8.121E+02	

Stream	FCW1 Return	FCW2 Slurry	FCW2 Liquor	FCW2 Solids	FCW2 Recycle	FCW2 Return	FCW3 Slurry	FCW3 Liquor	FCW3 Solids
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***3.219E-04***	***3.219E-04***	***3.219E-04***		***6.734E-07***	***3.212E-04***	***3.212E-04***	***3.212E-04***	
4-methyl-2-pentanone (MIBK)	***6.147E-05***	***6.147E-05***	***6.147E-05***		***1.286E-07***	***6.134E-05***	***6.134E-05***	***6.134E-05***	
Magnesium Oxalate	3.460E-04	3.471E-04	3.471E-04		7.261E-07	3.464E-04	3.475E-04	3.475E-04	
Magnesium Dichromate (VI)									
Magnesium Hydroxide		2.385E+02		2.385E+02			2.385E+02		2.385E+02
Manganese (II) Orthophosphate									
Manganese (II) Oxalate	2.854E-02	2.854E-02	2.854E-02		5.971E-05	2.848E-02	2.848E-02	2.848E-02	
Manganese (II) Hydroxide									
Nitrogen	1.267E-05	1.267E-05	1.267E-05		2.651E-08	1.265E-05	1.265E-05	1.265E-05	
Sodium Oxalate	1.182E+02	8.304E+03	1.187E+02	8.185E+03	2.484E-01	1.185E+02	8.304E+03	1.190E+02	8.185E+03
Sodium Chromate (VI)	1.819E+02	1.819E+02	1.819E+02		3.805E-01	1.815E+02	1.815E+02	1.815E+02	
Sodium Fluoride Sulfate									
Sodium Acetate	3.998E+00	3.998E+00	3.998E+00		8.364E-03	3.990E+00	3.990E+00	3.990E+00	
Sodium Glycolate	9.927E+01	9.927E+01	9.927E+01		2.077E-01	9.906E+01	9.906E+01	9.906E+01	
Sodium Nitrite	1.586E+03	1.585E+03	1.585E+03		3.316E+00	1.582E+03	1.582E+03	1.582E+03	
Sodium Hydroxide	7.620E+03	7.620E+03	7.620E+03		1.594E+01	7.604E+03	7.605E+03	7.605E+03	
Naphthalene	1.630E-05	1.630E-05	1.630E-05		3.410E-08	1.627E-05	1.627E-05	1.627E-05	
Sodium Aluminosilicate Gel		3.690E+03		3.690E+03			3.690E+03		3.690E+03
Nickel Orthophosphate									
Nickel (II) Oxalate	8.607E-02	8.607E-02	8.607E-02		1.801E-04	8.589E-02	8.589E-02	8.589E-02	
Nickel (II) Hydroxide									
Oxygen	7.052E-06	7.052E-06	7.052E-06		1.475E-08	7.037E-06	7.037E-06	7.037E-06	
Phosphorus Pentoxide	1.393E+01	1.393E+01	1.393E+01		2.913E-02	1.390E+01	1.390E+01	1.390E+01	
PYRENE	5.062E-04	5.062E-04	5.062E-04		1.059E-06	5.052E-04	5.052E-04	5.052E-04	
Silicon Dioxide	1.902E+00	1.903E+00	1.903E+00		3.981E-03	1.899E+00	1.900E+00	1.900E+00	
Sulfur Trioxide	1.035E+03	1.035E+03	1.035E+03		2.164E+00	1.032E+03	1.032E+03	1.032E+03	
1,2,4-trichlorobenzene	3.442E-06	3.442E-06	3.442E-06		7.200E-09	3.435E-06	3.435E-06	3.435E-06	
1,2,3-trichloropropane	2.426E-05	2.426E-05	2.426E-05		5.075E-08	2.421E-05	2.421E-05	2.421E-05	
TOLUENE	2.137E-06	2.137E-06	2.137E-06		4.471E-09	2.133E-06	2.133E-06	2.133E-06	
Zinc Dichloride Pentoxide									
Zinc Oxalate	2.482E+01	2.482E+01	2.482E+01		5.192E-02	2.477E+01	2.477E+01	2.477E+01	
Zinc Hydroxide									
Zirconium EDTA	3.301E-01	3.301E-01	3.301E-01		6.905E-04	3.294E-01	3.294E-01	3.294E-01	
Zirconium Oxide									
Total g/hr	5.818E+04	7.283E+04	5.828E+04	1.455E+04	1.219E+02	5.816E+04	7.281E+04	5.826E+04	1.455E+04
Volume, L/hr	4.771E+01	5.155E+01	4.780E+01	3.741E+00	1.000E-01	4.770E+01	5.154E+01	4.780E+01	3.741E+00
Enthalpy, cal/hr	-1.922E+08	-2.354E+08	-1.926E+08	-4.284E+07	-4.028E+05	-1.922E+08	-2.354E+08	-1.925E+08	-4.284E+07
Vapor fraction									
Solid fraction		3.615E-02		1.000E+00			3.615E-02		1.000E+00
Organic fraction									
Osmotic Pres, atm	1.736E+02	1.732E+02	1.732E+02		1.732E+02	1.732E+02	1.729E+02	1.729E+02	
Redox Pot, volts									
E-Con, 1/ohm-cm	2.010E-01	2.008E-01	2.008E-01		2.008E-01	2.008E-01	2.006E-01	2.006E-01	
E-Con, cm2/ohm-mol	2.110E+01	2.111E+01	2.111E+01		2.111E+01	2.111E+01	2.112E+01	2.112E+01	
Abs Visc, cP	2.323E+00	2.318E+00	2.318E+00		2.318E+00	2.318E+00	2.313E+00	2.313E+00	
Rel Visc	2.608E+00	2.602E+00	2.602E+00		2.602E+00	2.602E+00	2.596E+00	2.596E+00	
Ionic Strength	5.558E+00	5.545E+00	5.545E+00		5.545E+00	5.545E+00	5.533E+00	5.533E+00	

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	FCW3 Recycle	FCW3 Return	FCW4 Slurry	FCW4 Liquor	FCW4 Solids	FCW4 Recycle	FCW4 Return	FCWash5 Slurry	FCW5 Liquor
Phase	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	13.5029	13.5029	13.5012	13.5012		13.5012	13.5012	13.4994	13.4994
Total mol/hr	5.52076	2633.55	2738.06	2639.09	98.972	5.52096	2633.56	2738.07	2639.1
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide	1.909E-01	9.109E+01	9.097E+01	9.097E+01		1.903E-01	9.078E+01	9.066E+01	9.066E+01
Aldrin	***1.088E-06***	***5.190E-04***	***5.189E-04***	***5.190E-04***		***1.086E-06***	***5.179E-04***	***5.179E-04***	***5.179E-04***
Aluminum Hydrogen EDTA	6.466E-02	3.084E+01	3.086E+01	3.086E+01		6.455E-02	3.079E+01	3.080E+01	3.080E+01
Aluminum Hydroxide			7.806E+02		7.806E+02			7.808E+02	
Benzene	***5.367E-09***	***2.560E-06***	***2.560E-06***	***2.560E-06***		***5.356E-09***	***2.555E-06***	***2.555E-06***	***2.555E-06***
Bis(2-ethylhexyl)phthalate (BEHP)	***1.367E-05***	***6.521E-03***	***6.521E-03***	***6.521E-03***		***1.364E-05***	***6.508E-03***	***6.508E-03***	***6.508E-03***
Benzo(a)pyrene (BaP)	***8.988E-08***	***4.288E-05***	***4.180E+00***	***4.304E-05***	***4.180E+00***	***9.005E-08***	***4.295E-05***	***4.180E+00***	***4.312E-05***
Phenol	***1.905E-04***	***9.089E-02***	***9.089E-02***	***9.089E-02***		***1.901E-04***	***9.070E-02***	***9.070E-02***	***9.070E-02***
Calcium Chloride Oxide									
Calcium Oxalate	1.861E-02	8.880E+00	8.875E+00	8.875E+00		1.857E-02	8.856E+00	8.851E+00	8.851E+00
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Fluoride			1.536E+03		1.536E+03			1.536E+03	
Calcium Hydroxide									
Pentachlorophenol	***1.645E-05***	***7.848E-03***	***7.848E-03***	***7.848E-03***		***1.642E-05***	***7.832E-03***	***7.832E-03***	***7.832E-03***
Hexachlorobenzene	***2.146E-07***	***1.023E-04***	***4.183E+00***	***1.028E-04***	***4.183E+00***	***2.150E-07***	***1.025E-04***	***4.183E+00***	***1.029E-04***
Chlorobenzene	***1.151E-08***	***5.492E-06***	***5.492E-06***	***5.492E-06***		***1.149E-08***	***5.480E-06***	***5.480E-06***	***5.480E-06***
2-Chloronaphthalene	***3.093E-08***	***1.475E-05***	***1.475E-05***	***1.475E-05***		***3.086E-08***	***1.472E-05***	***1.472E-05***	***1.472E-05***
Carbon Dioxide	3.569E+00	1.703E+03	1.703E+03	1.703E+03		3.562E+00	1.699E+03	1.699E+03	1.699E+03
Cesium Acetate	8.970E-03	4.279E+00	4.279E+00	4.279E+00		8.952E-03	4.270E+00	4.270E+00	4.270E+00
Cesium Glycolate									
Dibenz[a,h]anthracene	***7.642E-06***	***3.646E-03***	***3.646E-03***	***3.646E-03***		***7.627E-06***	***3.638E-03***	***3.638E-03***	***3.638E-03***
1,2-dibromoethane	***2.767E-07***	***1.320E-04***	***1.320E-04***	***1.320E-04***		***2.761E-07***	***1.317E-04***	***1.317E-04***	***1.317E-04***
Diethyl phthalate	***4.156E-05***	***1.983E-02***	***1.983E-02***	***1.983E-02***		***4.148E-05***	***1.978E-02***	***1.978E-02***	***1.978E-02***
Iron (III) Oxalate									
Iron (III) Citrate									
Iron (III) Hydrogen EDTA	1.522E-02	7.262E+00	7.249E+00	7.249E+00		1.516E-02	7.234E+00	7.221E+00	7.221E+00
Iron (III) Hydroxide			8.320E+01		8.320E+01			8.320E+01	
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	5.150E-02	2.457E+01	2.457E+01	2.457E+01		5.140E-02	2.452E+01	2.452E+01	2.452E+01
Water	8.608E+01	4.106E+04	4.116E+04	4.116E+04		8.611E+01	4.108E+04	4.117E+04	4.117E+04
Sulfuric Acid									
Hydrogen Chloride	4.676E-01	2.230E+02	2.230E+02	2.230E+02		4.666E-01	2.226E+02	2.226E+02	2.226E+02
Formic Acid	1.801E-02	8.593E+00	8.593E+00	8.593E+00		1.798E-02	8.575E+00	8.575E+00	8.575E+00
Hydrofluoric Acid	1.390E-01	6.633E+01	6.633E+01	6.633E+01		1.388E-01	6.619E+01	6.619E+01	6.619E+01
Mercury (II) Chloride									
Mercury (elemental)	***2.636E-08***	***1.258E-05***	***1.258E-05***	***1.258E-05***		***2.631E-08***	***1.255E-05***	***1.255E-05***	***1.255E-05***
Mercury (II) Oxide	***1.819E-03***	***8.678E-01***	***2.951E+01***	***8.708E-01***	***2.864E+01***	***1.822E-03***	***8.689E-01***	***2.951E+01***	***8.719E-01***
Nitrous (III) Acid	4.223E+00	2.014E+03	2.015E+03	2.015E+03		4.215E+00	2.010E+03	2.011E+03	2.011E+03
Nitric Acid	2.899E+00	1.383E+03	1.383E+03	1.383E+03		2.894E+00	1.380E+03	1.380E+03	1.380E+03
Hexachlorobutadiene	***2.413E-10***	***1.151E-07***	***1.151E-07***	***1.151E-07***		***2.408E-10***	***1.149E-07***	***1.149E-07***	***1.149E-07***
Potassium Citrate	1.284E-01	6.125E+01	6.125E+01	6.125E+01		1.281E-01	6.112E+01	6.113E+01	6.113E+01
Potassium Acetate									
Potassium Chloride	1.699E+00	8.104E+02	8.104E+02	8.104E+02		1.695E+00	8.087E+02	8.087E+02	8.087E+02

Stream	FCW3 Recycle	FCW3 Return	FCW4 Slurry	FCW4 Liquor	FCW4 Solids	FCW4 Recycle	FCW4 Return	FCWash5 Slurry	FCW5 Liquor
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***6.720E-07***	***3.206E-04***	***3.206E-04***	***3.206E-04***		***6.706E-07***	***3.199E-04***	***3.199E-04***	***3.199E-04***
4-methyl-2-pentanone (MIBK)	***1.283E-07***	***6.121E-05***	***6.121E-05***	***6.121E-05***		***1.281E-07***	***6.108E-05***	***6.108E-05***	***6.108E-05***
Magnesium Oxalate	7.269E-07	3.468E-04	3.479E-04	3.479E-04		7.277E-07	3.471E-04	3.482E-04	3.482E-04
Magnesium Dichromate (VI)									
Magnesium Hydroxide			2.385E+02		2.385E+02			2.385E+02	
Manganese (II) Orthophosphate									
Manganese (II) Oxalate	5.959E-05	2.842E-02	2.842E-02	2.842E-02		5.946E-05	2.837E-02	2.837E-02	2.837E-02
Manganese (II) Hydroxide									
Nitrogen	2.646E-08	1.262E-05	1.262E-05	1.262E-05		2.640E-08	1.260E-05	1.260E-05	1.260E-05
Sodium Oxalate	2.490E-01	1.188E+02	8.304E+03	1.193E+02	8.184E+03	2.496E-01	1.191E+02	8.303E+03	1.196E+02
Sodium Chromate (VI)	3.797E-01	1.811E+02	1.811E+02	1.811E+02		3.790E-01	1.808E+02	1.808E+02	1.808E+02
Sodium Fluoride Sulfate									
Sodium Acetate	8.347E-03	3.982E+00	3.982E+00	3.982E+00		8.329E-03	3.973E+00	3.973E+00	3.973E+00
Sodium Glycolate	2.072E-01	9.886E+01	9.886E+01	9.886E+01		2.068E-01	9.865E+01	9.865E+01	9.865E+01
Sodium Nitrite	3.308E+00	1.578E+03	1.578E+03	1.578E+03		3.301E+00	1.574E+03	1.574E+03	1.574E+03
Sodium Hydroxide	1.591E+01	7.589E+03	7.589E+03	7.589E+03		1.588E+01	7.573E+03	7.573E+03	7.573E+03
Naphthalene	3.403E-08	1.623E-05	1.623E-05	1.623E-05		3.396E-08	1.620E-05	1.620E-05	1.620E-05
Sodium Aluminosilicate Gel			3.690E+03		3.690E+03			3.690E+03	
Nickel Orthophosphate									
Nickel (II) Oxalate	1.797E-04	8.571E-02	8.571E-02	8.571E-02		1.793E-04	8.553E-02	8.553E-02	8.553E-02
Nickel (II) Hydroxide									
Oxygen	1.472E-08	7.022E-06	7.022E-06	7.022E-06		1.469E-08	7.008E-06	7.008E-06	7.008E-06
Phosphorus Pentoxide	2.907E-02	1.387E+01	1.387E+01	1.387E+01		2.901E-02	1.384E+01	1.384E+01	1.384E+01
PYRENE	1.057E-06	5.041E-04	5.041E-04	5.041E-04		1.055E-06	5.030E-04	5.030E-04	5.030E-04
Silicon Dioxide	3.974E-03	1.896E+00	1.896E+00	1.896E+00		3.967E-03	1.892E+00	1.893E+00	1.893E+00
Sulfur Trioxide	2.160E+00	1.030E+03	1.030E+03	1.030E+03		2.155E+00	1.028E+03	1.028E+03	1.028E+03
1,2,4-trichlorobenzene	7.185E-09	3.427E-06	3.427E-06	3.427E-06		7.170E-09	3.420E-06	3.420E-06	3.420E-06
1,2,3-trichloropropane	5.064E-08	2.416E-05	2.416E-05	2.416E-05		5.054E-08	2.411E-05	2.411E-05	2.411E-05
TOLUENE	4.462E-09	2.128E-06	2.128E-06	2.128E-06		4.453E-09	2.124E-06	2.124E-06	2.124E-06
Zinc Dichloride Pentoxide									
Zinc Oxalate	5.182E-02	2.472E+01	2.472E+01	2.472E+01		5.171E-02	2.467E+01	2.467E+01	2.467E+01
Zinc Hydroxide									
Zirconium EDTA	6.890E-04	3.287E-01	3.287E-01	3.287E-01		6.876E-04	3.280E-01	3.280E-01	3.280E-01
Zirconium Oxide									
Total g/hr	1.219E+02	5.814E+04	7.279E+04	5.824E+04	1.455E+04	1.218E+02	5.812E+04	7.277E+04	5.822E+04
Volume, L/hr	1.000E-01	4.770E+01	5.154E+01	4.780E+01	3.741E+00	1.000E-01	4.770E+01	5.154E+01	4.780E+01
Enthalpy, cal/hr	-4.028E+05	-1.921E+08	-2.353E+08	-1.925E+08	-4.284E+07	-4.027E+05	-1.921E+08	-2.353E+08	-1.925E+08
Vapor fraction									
Solid fraction			3.615E-02		1.000E+00			3.615E-02	
Organic fraction									
Osmotic Pres, atm	1.729E+02	1.729E+02	1.725E+02	1.725E+02		1.725E+02	1.725E+02	1.722E+02	1.722E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.006E-01	2.006E-01	2.003E-01	2.003E-01		2.003E-01	2.003E-01	2.001E-01	2.001E-01
E-Con, cm2/ohm-mol	2.112E+01	2.112E+01	2.113E+01	2.113E+01		2.113E+01	2.113E+01	2.114E+01	2.114E+01
Abs Visc, cP	2.313E+00	2.313E+00	2.308E+00	2.308E+00		2.308E+00	2.308E+00	2.303E+00	2.303E+00
Rel Visc	2.596E+00	2.596E+00	2.591E+00	2.591E+00		2.591E+00	2.591E+00	2.585E+00	2.585E+00
Ionic Strength	5.533E+00	5.533E+00	5.520E+00	5.520E+00		5.520E+00	5.520E+00	5.508E+00	5.508E+00

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	FCW5 Solids	FCW5 Recycle	FCW5 Return	Leach-in	Total Leach	FCWash-Leach	Steam-in	Total Steam	UF2 Filtrate
Phase	Solid	Aqueous	Aqueous	Aqueous	Aqueous	Mixed	Aqueous	Aqueous	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH		13.4994	13.4994	17.8006	17.8006	14.9827	6.9969	6.9969	14.8733
Total mol/hr	98.9703	5.52114	2633.58	62.1856	608.973	3342.56	55.3332	395.386	1041.54
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid						4.236E+00			1.208E+00
Aluminum Oxide		1.897E-01	9.047E+01			6.958E+02			1.945E+02
Aldrin		***1.083E-06***	***5.168E-04***			***5.168E-04***			***1.474E-04***
Aluminum Hydrogen EDTA		6.444E-02	3.074E+01						
Aluminum Hydroxide	7.808E+02								
Benzene		***5.345E-09***	***2.550E-06***			***2.550E-06***			***7.273E-07***
Bis(2-ethylhexyl)phthalate (BEHP)		***1.361E-05***	***6.494E-03***			***6.494E-03***			***1.852E-03***
Benzo(a)pyrene (BaP)	***4.179E+00***	***9.021E-08***	***4.303E-05***			***4.180E+00***			***8.551E-06***
Phenol		***1.898E-04***	***9.051E-02***			***9.051E-02***			***2.582E-02***
Calcium Chloride Oxide									
Calcium Oxalate		1.852E-02	8.832E+00						
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)						2.837E+01			8.335E+00
Calcium Fluoride	1.536E+03					1.214E+03			
Calcium Hydroxide						3.032E+02			
Pentachlorophenol		***1.638E-05***	***7.815E-03***			***7.815E-03***			***2.229E-03***
Hexachlorobenzene	***4.183E+00***	***2.153E-07***	***1.027E-04***			***4.183E+00***			***2.041E-05***
Chlorobenzene		***1.146E-08***	***5.469E-06***			***5.469E-06***			***1.560E-06***
2-Chloronaphthalene		***3.080E-08***	***1.469E-05***			***1.469E-05***			***4.191E-06***
Carbon Dioxide		3.554E+00	1.695E+03			1.695E+03			4.836E+02
Cesium Acetate		8.933E-03	4.261E+00						
Cesium Glycolate						4.616E+00			1.317E+00
Dibenz[a,h]anthracene		***7.611E-06***	***3.630E-03***			***3.630E-03***			***1.036E-03***
1,2-dibromoethane		***2.755E-07***	***1.314E-04***			***1.314E-04***			***3.749E-05***
Diethyl phthalate		***4.139E-05***	***1.974E-02***			***1.974E-02***			***5.632E-03***
Iron (III) Oxalate						2.529E+01			9.862E+00
Iron (III) Citrate						4.876E+01			1.391E+01
Iron (III) Hydrogen EDTA		1.511E-02	7.205E+00			4.105E+01			1.171E+01
Iron (III) Hydroxide	8.320E+01					3.706E+01			3.022E+00
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid		5.129E-02	2.446E+01			2.446E+01			6.979E+00
Water		8.614E+01	4.109E+04	7.780E+02	7.619E+03	4.880E+04	9.968E+02	7.123E+03	1.593E+04
Sulfuric Acid									
Hydrogen Chloride		4.656E-01	2.221E+02			2.342E+02			6.680E+01
Formic Acid		1.794E-02	8.557E+00			8.557E+00			2.441E+00
Hydrofluoric Acid		1.385E-01	6.605E+01			5.709E+01			1.451E+01
Mercury (II) Chloride									
Mercury (elemental)		***2.626E-08***	***1.252E-05***			***1.252E-05***			***3.572E-06***
Mercury (II) Oxide	***2.864E+01***	***1.824E-03***	***8.701E-01***			***2.951E+01***			***9.502E-01***
Nitrous (III) Acid		4.206E+00	2.006E+03			3.077E+03			8.777E+02
Nitric Acid		2.888E+00	1.377E+03			1.377E+03			3.929E+02
Hexachlorobutadiene		***2.403E-10***	***1.146E-07***			***1.146E-07***			***3.270E-08***
Potassium Citrate		1.279E-01	6.100E+01						
Potassium Acetate									
Potassium Chloride		1.692E+00	8.070E+02			7.783E+02			2.220E+02

Stream	FCW5 Solids	FCW5 Recycle	FCW5 Return	Leach-in	Total Leach	FCWash-Leach	Steam-in	Total Steam	UF2 Filtrate
Potassium Glycolate						1.121E+02			3.197E+01
Potassium Nitrate (VI)									
gamma-BHC (Lindane)		***6.692E-07***	***3.192E-04***			***3.192E-04***			***9.106E-05***
4-methyl-2-pentanone (MIBK)		***1.278E-07***	***6.095E-05***			***6.095E-05***			***1.739E-05***
Magnesium Oxalate		7.285E-07	3.475E-04						
Magnesium Dichromate (VI)						2.469E-06			9.791E-07
Magnesium Hydroxide	2.385E+02					2.385E+02			
Manganese (II) Orthophosphate						2.341E-02			6.679E-03
Manganese (II) Oxalate		5.934E-05	2.831E-02						
Manganese (II) Hydroxide									
Nitrogen		2.635E-08	1.257E-05			1.257E-05			3.585E-06
Sodium Oxalate	8.184E+03	2.503E-01	1.194E+02			8.307E+03			
Sodium Chromate (VI)		3.782E-01	1.804E+02			1.445E+02			4.091E+01
Sodium Fluoride Sulfate						1.604E+03			
Sodium Acetate		8.312E-03	3.965E+00						
Sodium Glycolate		2.064E-01	9.844E+01						
Sodium Nitrite		3.293E+00	1.571E+03						
Sodium Hydroxide		1.584E+01	7.558E+03	7.599E+02	7.442E+03	1.498E+04			4.411E+03
Naphthalene		3.389E-08	1.616E-05			1.616E-05			4.611E-06
Sodium Aluminosilicate Gel	3.690E+03					3.348E+03			
Nickel Orthophosphate						7.098E-02			2.025E-02
Nickel (II) Oxalate		1.789E-04	8.535E-02						
Nickel (II) Hydroxide									
Oxygen		1.466E-08	6.993E-06			6.993E-06			1.995E-06
Phosphorus Pentoxide		2.895E-02	1.381E+01			1.377E+01			3.929E+00
PYRENE		1.052E-06	5.020E-04			5.020E-04			1.432E-04
Silicon Dioxide		3.961E-03	1.889E+00			1.258E+02			3.044E+01
Sulfur Trioxide		2.151E+00	1.026E+03			3.282E+02			1.861E+02
1,2,4-trichlorobenzene		7.155E-09	3.413E-06			3.413E-06			9.736E-07
1,2,3-trichloropropane		5.043E-08	2.406E-05			2.406E-05			6.862E-06
TOLUENE		4.443E-09	2.119E-06			2.119E-06			6.046E-07
Zinc Dichloride Pentoxide						1.453E+01			4.144E+00
Zinc Oxalate		5.160E-02	2.461E+01						
Zinc Hydroxide									
Zirconium EDTA		6.862E-04	3.273E-01						
Zirconium Oxide						1.063E-01			3.032E-02
Total g/hr	1.455E+04	1.218E+02	5.810E+04	1.538E+03	1.506E+04	8.771E+04	9.968E+02	7.123E+03	2.295E+04
Volume, L/hr	3.741E+00	1.000E-01	4.770E+01	1.001E+00	9.801E+00	6.020E+01	1.000E+00	7.146E+00	1.832E+01
Enthalpy, cal/hr	-4.284E+07	-4.027E+05	-1.921E+08	-4.956E+06	-4.854E+07	-2.840E+08	-3.780E+06	-2.701E+07	-7.708E+07
Vapor fraction									
Solid fraction	1.000E+00					2.920E-02			
Organic fraction									
Osmotic Pres, atm		1.722E+02	1.722E+02	4.623E+03	4.623E+03	4.195E+02			3.703E+02
Redox Pot, volts									
E-Con, 1/ohm-cm		2.001E-01	2.001E-01			2.602E-01	5.489E-08	5.489E-08	
E-Con, cm2/ohm-mol		2.114E+01	2.114E+01			2.326E+01			
Abs Visc, cP		2.303E+00	2.303E+00	4.904E+01	4.904E+01	4.276E+00	8.907E-01	8.907E-01	
Rel Visc		2.585E+00	2.585E+00	5.506E+01	5.506E+01	4.801E+00	1.000E+00	1.000E+00	
Ionic Strength		5.508E+00	5.508E+00	2.442E+01	2.442E+01	7.781E+00	1.008E-07	1.008E-07	7.029E+00

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	UF2 Slurry	SCWash1 Slurry	SCW1 Liquor	SCW1 Solids	SCW1 Recycle	SCW1 Return	SCW2 Slurry	SCW2 Liquor	SCW2 Solids
Phase	Mixed	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous	Solid
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	14.8733	14.8715	14.8715		14.8715	14.8715	14.8696	14.8696	
Total mol/hr	2703.34	2709	2615.48	93.5186	5.68446	2609.8	2708.98	2615.53	93.4496
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid	3.027E+00	3.027E+00	3.027E+00		6.580E-03	3.021E+00	3.021E+00	3.021E+00	
Aluminum Oxide	4.874E+02	4.873E+02	4.873E+02		1.059E+00	4.862E+02	4.861E+02	4.861E+02	
Aldrin	***3.694E-04***	***3.694E-04***	***3.694E-04***		***8.028E-07***	***3.686E-04***	***3.686E-04***	***3.686E-04***	
Aluminum Hydrogen EDTA									
Aluminum Hydroxide									
Benzene	***1.822E-06***	***1.822E-06***	***1.822E-06***		***3.961E-09***	***1.818E-06***	***1.818E-06***	***1.818E-06***	
Bis(2-ethylhexyl)phthalate (BEHP)	***4.642E-03***	***4.642E-03***	***4.642E-03***		***1.009E-05***	***4.632E-03***	***4.632E-03***	***4.632E-03***	
Benzo(a)pyrene (BaP)	***4.180E+00***	***4.180E+00***	***2.153E-05***	***4.180E+00***	***4.679E-08***	***2.148E-05***	***4.180E+00***	***2.158E-05***	***4.180E+00***
Phenol	***6.469E-02***	***6.469E-02***	***6.469E-02***		***1.406E-04***	***6.455E-02***	***6.455E-02***	***6.455E-02***	
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)	2.088E+01	2.089E+01	2.089E+01		4.541E-02	2.085E+01	2.086E+01	2.086E+01	
Calcium Fluoride	1.384E+03	1.387E+03		1.387E+03			1.389E+03		1.389E+03
Calcium Hydroxide	1.414E+02	1.388E+02		1.388E+02			1.361E+02		1.361E+02
Pentachlorophenol	***5.586E-03***	***5.586E-03***	***5.586E-03***		***1.214E-05***	***5.574E-03***	***5.574E-03***	***5.574E-03***	
Hexachlorobenzene	***4.183E+00***	***4.183E+00***	***5.139E-05***	***4.183E+00***	***1.117E-07***	***5.128E-05***	***4.183E+00***	***5.152E-05***	***4.183E+00***
Chlorobenzene	***3.909E-06***	***3.909E-06***	***3.909E-06***		***8.495E-09***	***3.900E-06***	***3.900E-06***	***3.900E-06***	
2-Chloronaphthalene	***1.050E-05***	***1.050E-05***	***1.050E-05***		***2.282E-08***	***1.048E-05***	***1.048E-05***	***1.048E-05***	
Carbon Dioxide	1.212E+03	1.212E+03	1.212E+03		2.634E+00	1.209E+03	1.209E+03	1.209E+03	
Cesium Acetate									
Cesium Glycolate	3.300E+00	3.300E+00	3.300E+00		7.171E-03	3.292E+00	3.292E+00	3.292E+00	
Dibenz[a,h]anthracene	***2.595E-03***	***2.595E-03***	***2.595E-03***		***5.640E-06***	***2.589E-03***	***2.589E-03***	***2.589E-03***	
1,2-dibromoethane	***9.394E-05***	***9.394E-05***	***9.394E-05***		***2.042E-07***	***9.373E-05***	***9.373E-05***	***9.373E-05***	
Diethyl phthalate	***1.411E-02***	***1.411E-02***	***1.411E-02***		***3.067E-05***	***1.408E-02***	***1.408E-02***	***1.408E-02***	
Iron (III) Oxalate	2.471E+01	2.485E+01	2.485E+01		5.400E-02	2.479E+01	2.493E+01	2.493E+01	
Iron (III) Citrate	3.485E+01	3.485E+01	3.485E+01		7.575E-02	3.478E+01	3.478E+01	3.478E+01	
Iron (III) Hydrogen EDTA	2.934E+01	2.934E+01	2.934E+01		6.376E-02	2.928E+01	2.928E+01	2.928E+01	
Iron (III) Hydroxide	2.876E+01	2.868E+01	7.427E+00	2.126E+01	1.614E-02	7.411E+00	2.859E+01	7.265E+00	2.133E+01
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	1.749E+01	1.749E+01	1.749E+01		3.800E-02	1.745E+01	1.745E+01	1.745E+01	
Water	3.991E+04	4.001E+04	4.001E+04		8.696E+01	3.992E+04	4.002E+04	4.002E+04	
Sulfuric Acid									
Hydrogen Chloride	1.674E+02	1.674E+02	1.674E+02		3.638E-01	1.670E+02	1.670E+02	1.670E+02	
Formic Acid	6.116E+00	6.116E+00	6.116E+00		1.329E-02	6.103E+00	6.103E+00	6.103E+00	
Hydrofluoric Acid	3.635E+01	3.629E+01	3.629E+01		7.886E-02	3.621E+01	3.615E+01	3.615E+01	
Mercury (II) Chloride									
Mercury (elemental)	***8.951E-06***	***8.951E-06***	***8.951E-06***		***1.945E-08***	***8.932E-06***	***8.932E-06***	***8.932E-06***	
Mercury (II) Oxide	***2.856E+01***	***2.856E+01***	***2.381E+00***	***2.617E+01***	***5.174E-03***	***2.375E+00***	***2.855E+01***	***2.375E+00***	***2.617E+01***
Nitrous (III) Acid	2.199E+03	2.199E+03	2.199E+03		4.780E+00	2.194E+03	2.194E+03	2.194E+03	
Nitric Acid	9.845E+02	9.845E+02	9.845E+02		2.140E+00	9.823E+02	9.823E+02	9.823E+02	
Hexachlorobutadiene	***8.194E-08***	***8.194E-08***	***8.194E-08***		***1.781E-10***	***8.176E-08***	***8.176E-08***	***8.176E-08***	
Potassium Citrate									
Potassium Acetate									
Potassium Chloride	5.563E+02	5.563E+02	5.563E+02		1.209E+00	5.551E+02	5.551E+02	5.551E+02	

Stream	UF2 Slurry	SCWash1 Slurry	SCW1 Liquor	SCW1 Solids	SCW1 Recycle	SCW1 Return	SCW2 Slurry	SCW2 Liquor	SCW2 Solids
Potassium Glycolate	8.011E+01	8.011E+01	8.011E+01		1.741E-01	7.994E+01	7.994E+01	7.994E+01	
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***2.282E-04***	***2.282E-04***	***2.282E-04***		***4.959E-07***	***2.277E-04***	***2.277E-04***	***2.277E-04***	
4-methyl-2-pentanone (MIBK)	***4.357E-05***	***4.357E-05***	***4.357E-05***		***9.469E-08***	***4.347E-05***	***4.347E-05***	***4.347E-05***	
Magnesium Oxalate									
Magnesium Dichromate (VI)	2.453E-06	2.468E-06	2.468E-06		5.363E-09	2.462E-06	2.477E-06	2.477E-06	
Magnesium Hydroxide	2.385E+02	2.385E+02		2.385E+02			2.385E+02		2.385E+02
Manganese (II) Orthophosphate	1.674E-02	1.674E-02	1.674E-02		3.637E-05	1.670E-02	1.670E-02	1.670E-02	
Manganese (II) Oxalate									
Manganese (II) Hydroxide									
Nitrogen	8.984E-06	8.984E-06	8.984E-06		1.952E-08	8.964E-06	8.964E-06	8.964E-06	
Sodium Oxalate	8.297E+03	8.297E+03		8.297E+03			8.297E+03		8.297E+03
Sodium Chromate (VI)	1.025E+02	1.025E+02	1.025E+02		2.228E-01	1.023E+02	1.023E+02	1.023E+02	
Sodium Fluoride Sulfate	8.589E+02	8.463E+02		8.463E+02			8.336E+02		8.336E+02
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide	1.105E+04	1.106E+04	1.106E+04		2.404E+01	1.104E+04	1.105E+04	1.105E+04	
Naphthalene	1.155E-05	1.155E-05	1.155E-05		2.511E-08	1.153E-05	1.153E-05	1.153E-05	
Sodium Aluminosilicate Gel	3.401E+03	3.401E+03		3.401E+03			3.402E+03		3.402E+03
Nickel Orthophosphate	5.073E-02	5.073E-02	5.073E-02		1.103E-04	5.062E-02	5.062E-02	5.062E-02	
Nickel (II) Oxalate									
Nickel (II) Hydroxide									
Oxygen	4.998E-06	4.998E-06	4.998E-06		1.086E-08	4.987E-06	4.987E-06	4.987E-06	
Phosphorus Pentoxide	9.844E+00	9.844E+00	9.844E+00		2.139E-02	9.822E+00	9.822E+00	9.822E+00	
PYRENE	3.588E-04	3.588E-04	3.588E-04		7.798E-07	3.580E-04	3.580E-04	3.580E-04	
Silicon Dioxide	7.628E+01	7.610E+01	7.610E+01		1.654E-01	7.593E+01	7.575E+01	7.575E+01	
Sulfur Trioxide	4.662E+02	4.717E+02	4.717E+02		1.025E+00	4.707E+02	4.762E+02	4.762E+02	
1,2,4-trichlorobenzene	2.439E-06	2.439E-06	2.439E-06		5.302E-09	2.434E-06	2.434E-06	2.434E-06	
1,2,3-trichloropropane	1.719E-05	1.719E-05	1.719E-05		3.737E-08	1.716E-05	1.716E-05	1.716E-05	
TOLUENE	1.515E-06	1.515E-06	1.515E-06		3.292E-09	1.512E-06	1.512E-06	1.512E-06	
Zinc Dichloride Pentoxide	1.038E+01	1.038E+01	1.038E+01		2.257E-02	1.036E+01	1.036E+01	1.036E+01	
Zinc Oxalate									
Zinc Hydroxide									
Zirconium EDTA									
Zirconium Oxide	7.598E-02	7.598E-02	7.598E-02		1.651E-04	7.581E-02	7.581E-02	7.581E-02	
Total g/hr	7.188E+04	7.198E+04	5.762E+04	1.436E+04	1.252E+02	5.749E+04	7.195E+04	5.760E+04	1.435E+04
Volume, L/hr	4.911E+01	4.921E+01	4.601E+01	3.198E+00	1.000E-01	4.591E+01	4.921E+01	4.601E+01	3.198E+00
Enthalpy, cal/hr	-2.340E+08	-2.344E+08	-1.935E+08	-4.087E+07	-4.206E+05	-1.931E+08	-2.344E+08	-1.935E+08	-4.084E+07
Vapor fraction									
Solid fraction	3.462E-02	3.452E-02		1.000E+00			3.450E-02		1.000E+00
Organic fraction									
Osmotic Pres, atm	3.703E+02	3.695E+02	3.695E+02		3.695E+02	3.695E+02	3.687E+02	3.687E+02	
Redox Pot, volts									
E-Con, 1/ohm-cm		2.592E-01	2.592E-01		2.592E-01	2.592E-01	2.592E-01	2.592E-01	
E-Con, cm2/ohm-mol		2.445E+01	2.445E+01		2.445E+01	2.445E+01	2.448E+01	2.448E+01	
Abs Visc, cP		3.701E+00	3.701E+00		3.701E+00	3.701E+00	3.692E+00	3.692E+00	
Rel Visc		4.155E+00	4.155E+00		4.155E+00	4.155E+00	4.145E+00	4.145E+00	
Ionic Strength	7.029E+00	7.017E+00	7.017E+00		7.017E+00	7.017E+00	7.005E+00	7.005E+00	

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	SCW2 Recycle	SCW2 Return	SCW3 Slurry	SCW3 Liquor	SCW3 Solids	SCW3 Recycle	SCW3 Return	SCW4 Slurry	SCW4 Liquor
Phase	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	14.8696	14.8696	14.8678	14.8678		14.8678	14.8678	14.866	14.866
Total mol/hr	5.68434	2609.84	2708.95	2615.57	93.3801	5.68422	2609.89	2708.93	2615.62
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid	6.565E-03	3.014E+00	3.014E+00	3.014E+00		6.551E-03	3.008E+00	3.008E+00	3.008E+00
Aluminum Oxide	1.056E+00	4.850E+02	4.849E+02	4.849E+02		1.054E+00	4.839E+02	4.837E+02	4.837E+02
Aldrin	***8.010E-07***	***3.678E-04***	***3.678E-04***	***3.678E-04***		***7.992E-07***	***3.670E-04***	***3.670E-04***	***3.670E-04***
Aluminum Hydrogen EDTA									
Aluminum Hydroxide									
Benzene	***3.952E-09***	***1.814E-06***	***1.814E-06***	***1.814E-06***		***3.943E-09***	***1.811E-06***	***1.811E-06***	***1.811E-06***
Bis(2-ethylhexyl)phthalate (BEHP)	***1.007E-05***	***4.622E-03***	***4.622E-03***	***4.622E-03***		***1.004E-05***	***4.612E-03***	***4.612E-03***	***4.612E-03***
Benzo(a)pyrene (BaP)	***4.691E-08***	***2.154E-05***	***4.180E+00***	***2.164E-05***	***4.180E+00***	***4.702E-08***	***2.159E-05***	***4.180E+00***	***2.169E-05***
Phenol	***1.403E-04***	***6.441E-02***	***6.441E-02***	***6.441E-02***		***1.400E-04***	***6.427E-02***	***6.427E-02***	***6.427E-02***
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)	4.533E-02	2.081E+01	2.082E+01	2.082E+01		4.525E-02	2.078E+01	2.079E+01	2.079E+01
Calcium Fluoride			1.392E+03		1.392E+03			1.395E+03	
Calcium Hydroxide			1.334E+02		1.334E+02			1.307E+02	
Pentachlorophenol	***1.211E-05***	***5.562E-03***	***5.562E-03***	***5.562E-03***		***1.209E-05***	***5.550E-03***	***5.550E-03***	***5.550E-03***
Hexachlorobenzene	***1.120E-07***	***5.141E-05***	***4.183E+00***	***5.165E-05***	***4.183E+00***	***1.123E-07***	***5.154E-05***	***4.183E+00***	***5.178E-05***
Chlorobenzene	***8.476E-09***	***3.892E-06***	***3.892E-06***	***3.892E-06***		***8.458E-09***	***3.883E-06***	***3.883E-06***	***3.883E-06***
2-Chloronaphthalene	***2.277E-08***	***1.045E-05***	***1.045E-05***	***1.045E-05***		***2.272E-08***	***1.043E-05***	***1.043E-05***	***1.043E-05***
Carbon Dioxide	2.628E+00	1.207E+03	1.207E+03	1.207E+03		2.622E+00	1.204E+03	1.204E+03	1.204E+03
Cesium Acetate									
Cesium Glycolate	7.155E-03	3.285E+00	3.285E+00	3.285E+00		7.139E-03	3.278E+00	3.278E+00	3.278E+00
Dibenz[a,h]anthracene	***5.627E-06***	***2.584E-03***	***2.584E-03***	***2.584E-03***		***5.615E-06***	***2.578E-03***	***2.578E-03***	***2.578E-03***
1,2-dibromoethane	***2.037E-07***	***9.353E-05***	***9.353E-05***	***9.353E-05***		***2.033E-07***	***9.333E-05***	***9.332E-05***	***9.332E-05***
Diethyl phthalate	***3.060E-05***	***1.405E-02***	***1.405E-02***	***1.405E-02***		***3.053E-05***	***1.402E-02***	***1.402E-02***	***1.402E-02***
Iron (III) Oxalate	5.417E-02	2.487E+01	2.501E+01	2.501E+01		5.435E-02	2.495E+01	2.509E+01	2.509E+01
Iron (III) Citrate	7.558E-02	3.470E+01	3.470E+01	3.470E+01		7.542E-02	3.463E+01	3.463E+01	3.463E+01
Iron (III) Hydrogen EDTA	6.362E-02	2.921E+01	2.921E+01	2.921E+01		6.348E-02	2.915E+01	2.915E+01	2.915E+01
Iron (III) Hydroxide	1.579E-02	7.249E+00	2.850E+01	7.104E+00	2.139E+01	1.544E-02	7.089E+00	2.841E+01	6.945E+00
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	3.792E-02	1.741E+01	1.741E+01	1.741E+01		3.784E-02	1.737E+01	1.737E+01	1.737E+01
Water	8.698E+01	3.994E+04	4.003E+04	4.003E+04		8.700E+01	3.995E+04	4.005E+04	4.005E+04
Sulfuric Acid									
Hydrogen Chloride	3.630E-01	1.667E+02	1.667E+02	1.667E+02		3.622E-01	1.663E+02	1.663E+02	1.663E+02
Formic Acid	1.326E-02	6.090E+00	6.089E+00	6.089E+00		1.323E-02	6.076E+00	6.076E+00	6.076E+00
Hydrofluoric Acid	7.856E-02	3.607E+01	3.601E+01	3.601E+01		7.825E-02	3.593E+01	3.587E+01	3.587E+01
Mercury (II) Chloride									
Mercury (elemental)	***1.941E-08***	***8.913E-06***	***8.913E-06***	***8.913E-06***		***1.937E-08***	***8.893E-06***	***8.893E-06***	***8.893E-06***
Mercury (II) Oxide	***5.162E-03***	***2.370E+00***	***2.854E+01***	***2.370E+00***	***2.618E+01***	***5.150E-03***	***2.364E+00***	***2.854E+01***	***2.364E+00***
Nitrous (III) Acid	4.769E+00	2.190E+03	2.190E+03	2.190E+03		4.758E+00	2.185E+03	2.185E+03	2.185E+03
Nitric Acid	2.135E+00	9.802E+02	9.802E+02	9.802E+02		2.130E+00	9.781E+02	9.781E+02	9.781E+02
Hexachlorobutadiene	***1.777E-10***	***8.158E-08***	***8.158E-08***	***8.158E-08***		***1.773E-10***	***8.141E-08***	***8.141E-08***	***8.141E-08***
Potassium Citrate									
Potassium Acetate									
Potassium Chloride	1.206E+00	5.539E+02	5.539E+02	5.539E+02		1.204E+00	5.527E+02	5.527E+02	5.527E+02

Stream	SCW2 Recycle	SCW2 Return	SCW3 Slurry	SCW3 Liquor	SCW3 Solids	SCW3 Recycle	SCW3 Return	SCW4 Slurry	SCW4 Liquor
Potassium Glycolate	1.737E-01	7.977E+01	7.977E+01	7.977E+01		1.733E-01	7.959E+01	7.959E+01	7.959E+01
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***4.948E-07***	***2.272E-04***	***2.272E-04***	***2.272E-04***		***4.937E-07***	***2.267E-04***	***2.267E-04***	***2.267E-04***
4-methyl-2-pentanone (MIBK)	***9.448E-08***	***4.338E-05***	***4.338E-05***	***4.338E-05***		***9.427E-08***	***4.328E-05***	***4.328E-05***	***4.328E-05***
Magnesium Oxalate									
Magnesium Dichromate (VI)	5.383E-09	2.471E-06	2.486E-06	2.486E-06		5.402E-09	2.481E-06	2.495E-06	2.495E-06
Magnesium Hydroxide			2.385E+02		2.385E+02			2.385E+02	
Manganese (II) Orthophosphate	3.629E-05	1.666E-02	1.666E-02	1.666E-02		3.621E-05	1.663E-02	1.663E-02	1.663E-02
Manganese (II) Oxalate									
Manganese (II) Hydroxide									
Nitrogen	1.948E-08	8.945E-06	8.945E-06	8.945E-06		1.944E-08	8.925E-06	8.925E-06	8.925E-06
Sodium Oxalate			8.297E+03		8.297E+03			8.297E+03	
Sodium Chromate (VI)	2.223E-01	1.020E+02	1.020E+02	1.020E+02		2.217E-01	1.018E+02	1.018E+02	1.018E+02
Sodium Fluoride Sulfate			8.208E+02		8.208E+02			8.080E+02	
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide	2.401E+01	1.102E+04	1.103E+04	1.103E+04		2.397E+01	1.101E+04	1.101E+04	1.101E+04
Naphthalene	2.506E-08	1.150E-05	1.150E-05	1.150E-05		2.500E-08	1.148E-05	1.148E-05	1.148E-05
Sodium Aluminosilicate Gel			3.402E+03		3.402E+03			3.403E+03	
Nickel Orthophosphate	1.100E-04	5.051E-02	5.051E-02	5.051E-02		1.098E-04	5.040E-02	5.040E-02	5.040E-02
Nickel (II) Oxalate									
Nickel (II) Hydroxide									
Oxygen	1.084E-08	4.977E-06	4.977E-06	4.977E-06		1.082E-08	4.966E-06	4.966E-06	4.966E-06
Phosphorus Pentoxide	2.135E-02	9.801E+00	9.801E+00	9.801E+00		2.130E-02	9.780E+00	9.780E+00	9.780E+00
PYRENE	7.781E-07	3.572E-04	3.572E-04	3.572E-04		7.764E-07	3.565E-04	3.565E-04	3.565E-04
Silicon Dioxide	1.646E-01	7.559E+01	7.541E+01	7.541E+01		1.639E-01	7.524E+01	7.506E+01	7.506E+01
Sulfur Trioxide	1.035E+00	4.752E+02	4.807E+02	4.807E+02		1.045E+00	4.797E+02	4.853E+02	4.853E+02
1,2,4-trichlorobenzene	5.290E-09	2.429E-06	2.429E-06	2.429E-06		5.278E-09	2.424E-06	2.424E-06	2.424E-06
1,2,3-trichloropropane	3.729E-08	1.712E-05	1.712E-05	1.712E-05		3.721E-08	1.708E-05	1.708E-05	1.708E-05
TOLUENE	3.285E-09	1.508E-06	1.508E-06	1.508E-06		3.278E-09	1.505E-06	1.505E-06	1.505E-06
Zinc Dichloride Pentoxide	2.252E-02	1.034E+01	1.034E+01	1.034E+01		2.247E-02	1.032E+01	1.032E+01	1.032E+01
Zinc Oxalate									
Zinc Hydroxide									
Zirconium EDTA									
Zirconium Oxide	1.648E-04	7.565E-02	7.565E-02	7.565E-02		1.644E-04	7.548E-02	7.548E-02	7.548E-02
Total g/hr	1.252E+02	5.748E+04	7.193E+04	5.759E+04	1.434E+04	1.252E+02	5.746E+04	7.190E+04	5.758E+04
Volume, L/hr	1.000E-01	4.591E+01	4.921E+01	4.601E+01	3.198E+00	1.000E-01	4.591E+01	4.921E+01	4.602E+01
Enthalpy, cal/hr	-4.206E+05	-1.931E+08	-2.343E+08	-1.935E+08	-4.081E+07	-4.206E+05	-1.931E+08	-2.343E+08	-1.935E+08
Vapor fraction									
Solid fraction			3.447E-02		1.000E+00			3.445E-02	
Organic fraction									
Osmotic Pres, atm	3.687E+02	3.687E+02	3.679E+02	3.679E+02		3.679E+02	3.679E+02	3.672E+02	3.672E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.592E-01	2.592E-01	2.591E-01	2.591E-01		2.591E-01	2.591E-01	2.591E-01	2.591E-01
E-Con, cm2/ohm-mol	2.448E+01	2.448E+01	2.451E+01	2.451E+01		2.451E+01	2.451E+01	2.454E+01	2.454E+01
Abs Visc, cP	3.692E+00	3.692E+00	3.684E+00	3.684E+00		3.684E+00	3.684E+00	3.675E+00	3.675E+00
Rel Visc	4.145E+00	4.145E+00	4.136E+00	4.136E+00		4.136E+00	4.136E+00	4.126E+00	4.126E+00
Ionic Strength	7.005E+00	7.005E+00	6.993E+00	6.993E+00		6.993E+00	6.993E+00	6.982E+00	6.982E+00

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	SCW4 Solids	SCW4 Recycle	SCW4 Return	SCWash5 Slurry	SCW5 Liquor	SCW5 Solids	SCW5 Recycle	SCW5 Return	Acid Rinse
Phase	Solid	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH		14.866	14.866	14.8642	14.8642		14.8642	14.8642	-0.301785
Total mol/hr	93.3101	5.6841	2609.94	2708.91	2615.67	93.2397	5.68398	2609.99	53.9076
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid		6.536E-03	3.001E+00	3.001E+00	3.001E+00		6.522E-03	2.995E+00	
Aluminum Oxide		1.051E+00	4.827E+02	4.825E+02	4.825E+02		1.049E+00	4.815E+02	1.214E+00
Aldrin		***7.975E-07***	***3.662E-04***	***3.662E-04***	***3.662E-04***		***7.957E-07***	***3.654E-04***	
Aluminum Hydrogen EDTA									
Aluminum Hydroxide									
Benzene		***3.935E-09***	***1.807E-06***	***1.807E-06***	***1.807E-06***		***3.926E-09***	***1.803E-06***	
Bis(2-ethylhexyl)phthalate (BEHP)		***1.002E-05***	***4.601E-03***	***4.601E-03***	***4.601E-03***		***9.999E-06***	***4.591E-03***	
Benzo(a)pyrene (BaP)	***4.180E+00***	***4.714E-08***	***2.165E-05***	***4.180E+00***	***2.175E-05***	***4.180E+00***	***4.726E-08***	***2.170E-05***	
Phenol		***1.397E-04***	***6.413E-02***	***6.413E-02***	***6.413E-02***		***1.394E-04***	***6.399E-02***	
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)		4.517E-02	2.074E+01	2.075E+01	2.075E+01		4.509E-02	2.070E+01	
Calcium Fluoride	1.395E+03			1.398E+03		1.398E+03			
Calcium Hydroxide	1.307E+02			1.280E+02		1.280E+02			
Pentachlorophenol		***1.206E-05***	***5.538E-03***	***5.538E-03***	***5.538E-03***		***1.203E-05***	***5.526E-03***	
Hexachlorobenzene	***4.183E+00***	***1.125E-07***	***5.167E-05***	***4.183E+00***	***5.191E-05***	***4.183E+00***	***1.128E-07***	***5.180E-05***	
Chlorobenzene		***8.439E-09***	***3.875E-06***	***3.875E-06***	***3.875E-06***		***8.420E-09***	***3.866E-06***	
2-Chloronaphthalene		***2.267E-08***	***1.041E-05***	***1.041E-05***	***1.041E-05***		***2.262E-08***	***1.039E-05***	
Carbon Dioxide		2.616E+00	1.201E+03	1.201E+03	1.201E+03		2.611E+00	1.199E+03	
Cesium Acetate									
Cesium Glycolate		7.124E-03	3.271E+00	3.271E+00	3.271E+00		7.108E-03	3.264E+00	
Dibenz[a,h]anthracene		***5.602E-06***	***2.572E-03***	***2.572E-03***	***2.572E-03***		***5.590E-06***	***2.567E-03***	
1,2-dibromoethane		***2.028E-07***	***9.312E-05***	***9.312E-05***	***9.312E-05***		***2.024E-07***	***9.292E-05***	
Diethyl phthalate		***3.047E-05***	***1.399E-02***	***1.399E-02***	***1.399E-02***		***3.040E-05***	***1.396E-02***	
Iron (III) Oxalate		5.452E-02	2.503E+01	2.517E+01	2.517E+01		5.469E-02	2.511E+01	
Iron (III) Citrate		7.525E-02	3.455E+01	3.455E+01	3.455E+01		7.508E-02	3.448E+01	
Iron (III) Hydrogen EDTA		6.334E-02	2.908E+01	2.908E+01	2.908E+01		6.320E-02	2.902E+01	
Iron (III) Hydroxide	2.146E+01	1.509E-02	6.930E+00	2.831E+01	6.786E+00	2.153E+01	1.475E-02	6.772E+00	9.175E-01
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid		3.775E-02	1.733E+01	1.733E+01	1.733E+01		3.767E-02	1.730E+01	
Water		8.703E+01	3.996E+04	4.006E+04	4.006E+04		8.705E+01	3.997E+04	9.343E+02
Sulfuric Acid									
Hydrogen Chloride		3.614E-01	1.659E+02	1.659E+02	1.659E+02		3.606E-01	1.656E+02	
Formic Acid		1.320E-02	6.063E+00	6.063E+00	6.063E+00		1.318E-02	6.050E+00	
Hydrofluoric Acid		7.795E-02	3.579E+01	3.573E+01	3.573E+01		7.765E-02	3.566E+01	
Mercury (II) Chloride									
Mercury (elemental)		***1.933E-08***	***8.874E-06***	***8.874E-06***	***8.874E-06***		***1.928E-08***	***8.855E-06***	
Mercury (II) Oxide	***2.618E+01***	***5.138E-03***	***2.359E+00***	***2.853E+01***	***2.359E+00***	***2.618E+01***	***5.126E-03***	***2.354E+00***	
Nitrous (III) Acid		4.748E+00	2.180E+03	2.180E+03	2.180E+03		4.737E+00	2.175E+03	
Nitric Acid		2.125E+00	9.759E+02	9.759E+02	9.759E+02		2.121E+00	9.738E+02	1.266E+02
Hexachlorobutadiene		***1.769E-10***	***8.123E-08***	***8.123E-08***	***8.123E-08***		***1.765E-10***	***8.105E-08***	
Potassium Citrate									
Potassium Acetate									
Potassium Chloride		1.201E+00	5.515E+02	5.515E+02	5.515E+02		1.198E+00	5.503E+02	

Stream	SCW4 Solids	SCW4 Recycle	SCW4 Return	SCWash5 Slurry	SCW5 Liquor	SCW5 Solids	SCW5 Recycle	SCW5 Return	Acid Rinse
Potassium Glycolate		1.730E-01	7.942E+01	7.942E+01	7.942E+01		1.726E-01	7.925E+01	
Potassium Nitrate (VI)									
gamma-BHC (Lindane)		***4.926E-07***	***2.262E-04***	***2.262E-04***	***2.262E-04***		***4.915E-07***	***2.257E-04***	
4-methyl-2-pentanone (MIBK)		***9.406E-08***	***4.319E-05***	***4.319E-05***	***4.319E-05***		***9.385E-08***	***4.310E-05***	
Magnesium Oxalate									
Magnesium Dichromate (VI)		5.422E-09	2.490E-06	2.504E-06	2.504E-06		5.442E-09	2.499E-06	
Magnesium Hydroxide	2.385E+02			2.385E+02		2.385E+02			4.297E-02
Manganese (II) Orthophosphate		3.613E-05	1.659E-02	1.659E-02	1.659E-02		3.605E-05	1.655E-02	
Manganese (II) Oxalate									
Manganese (II) Hydroxide									5.433E-02
Nitrogen		1.940E-08	8.906E-06	8.906E-06	8.906E-06		1.935E-08	8.886E-06	
Sodium Oxalate	8.296E+03			8.296E+03		8.296E+03			
Sodium Chromate (VI)		2.212E-01	1.016E+02	1.016E+02	1.016E+02		2.207E-01	1.013E+02	
Sodium Fluoride Sulfate	8.080E+02			7.950E+02		7.950E+02			
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide		2.394E+01	1.099E+04	1.100E+04	1.100E+04		2.390E+01	1.097E+04	4.629E-01
Naphthalene		2.494E-08	1.145E-05	1.145E-05	1.145E-05		2.489E-08	1.143E-05	
Sodium Aluminosilicate Gel	3.403E+03			3.403E+03		3.403E+03			
Nickel Orthophosphate		1.095E-04	5.029E-02	5.029E-02	5.029E-02		1.093E-04	5.018E-02	
Nickel (II) Oxalate									
Nickel (II) Hydroxide									1.663E-01
Oxygen		1.079E-08	4.955E-06	4.955E-06	4.955E-06		1.077E-08	4.944E-06	
Phosphorus Pentoxide		2.125E-02	9.758E+00	9.758E+00	9.758E+00		2.121E-02	9.737E+00	
PYRENE		7.746E-07	3.557E-04	3.557E-04	3.557E-04		7.729E-07	3.549E-04	
Silicon Dioxide		1.631E-01	7.490E+01	7.473E+01	7.473E+01		1.624E-01	7.456E+01	1.093E-01
Sulfur Trioxide		1.055E+00	4.842E+02	4.899E+02	4.899E+02		1.064E+00	4.888E+02	
1,2,4-trichlorobenzene		5.267E-09	2.418E-06	2.418E-06	2.418E-06		5.255E-09	2.413E-06	
1,2,3-trichloropropane		3.712E-08	1.705E-05	1.705E-05	1.705E-05		3.704E-08	1.701E-05	
TOLUENE		3.271E-09	1.502E-06	1.502E-06	1.502E-06		3.263E-09	1.499E-06	
Zinc Dichloride Pentoxide		2.242E-02	1.029E+01	1.029E+01	1.029E+01		2.237E-02	1.027E+01	
Zinc Oxalate									
Zinc Hydroxide									
Zirconium EDTA									
Zirconium Oxide		1.640E-04	7.532E-02	7.532E-02	7.532E-02		1.637E-04	7.515E-02	3.279E-01
Total g/hr	1.433E+04	1.251E+02	5.745E+04	7.188E+04	5.756E+04	1.432E+04	1.251E+02	5.744E+04	1.064E+03
Volume, L/hr	3.198E+00	1.000E-01	4.592E+01	4.922E+01	4.602E+01	3.198E+00	1.000E-01	4.592E+01	1.000E+00
Enthalpy, cal/hr	-4.078E+07	-4.205E+05	-1.931E+08	-2.342E+08	-1.935E+08	-4.075E+07	-4.205E+05	-1.931E+08	-3.648E+06
Vapor fraction									
Solid fraction	1.000E+00			3.442E-02		1.000E+00			
Organic fraction									
Osmotic Pres, atm		3.672E+02	3.672E+02	3.664E+02	3.664E+02		3.664E+02	3.664E+02	9.744E+01
Redox Pot, volts									
E-Con, 1/ohm-cm		2.591E-01	2.591E-01	2.591E-01	2.591E-01		2.591E-01	2.591E-01	5.395E-01
E-Con, cm2/ohm-mol		2.454E+01	2.454E+01	2.457E+01	2.457E+01		2.457E+01	2.457E+01	2.691E+02
Abs Visc, cP		3.675E+00	3.675E+00	3.667E+00	3.667E+00		3.667E+00	3.667E+00	9.672E-01
Rel Visc		4.126E+00	4.126E+00	4.116E+00	4.116E+00		4.116E+00	4.116E+00	1.086E+00
Ionic Strength		6.982E+00	6.982E+00	6.970E+00	6.970E+00		6.970E+00	6.970E+00	2.114E+00

Table B- 1. Waste Feed Evaporator 5 Stage Model Results for UF 1.22 Density Case (cont'd)[8]

Stream	Total Acid	Caustic Rinse	Total C Rinse	Acc1 Recycle	Total Recycle	HLW OG Cond	Evap Feed
Phase	Aqueous	Aqueous	Aqueous	Mixed	Mixed	Mixed	Mixed
Temperature, C	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1
pH	-0.301785	12.8948	12.8948	14.2654	13.4748	11.2694	13.0705
Total mol/hr	808.918	55.498	2498.34	38.9656	4402.02	188132	197463
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer							
Acetic Acid				5.773E-02	1.286E+00		
Aluminum Oxide	1.822E+01			3.044E+00	1.567E+02	1.231E+00	2.657E+03
Aldrin				***7.043E-06***	***1.568E-04***		***4.195E+00***
Aluminum Hydrogen EDTA							1.741E+03
Aluminum Hydroxide					6.264E+01		3.103E+03
Benzene				***3.475E-08***	***7.739E-07***		***4.194E+00***
Bis(2-ethylhexyl)phthalate (BEHP)				***8.851E-05***	***1.971E-03***		***4.193E+00***
Benzo(a)pyrene (BaP)				***5.431E-07***	***9.236E-06***		***4.181E+00***
Phenol				***1.234E-03***	***2.747E-02***		***4.196E+00***
Calcium Chloride Oxide						5.464E+02	
Calcium Oxalate						5.512E+00	6.736E+02
Calcium Oxalate Monohydrate						2.059E+00	
Calcium Carbonate					2.337E+00		
Calcium Dichromate (VI)				2.768E-01	2.770E+00		
Calcium Fluoride						5.358E+02	3.237E+02
Calcium Hydroxide							
Pentachlorophenol				***1.065E-04***	***2.372E-03***		***4.196E+00***
Hexachlorobenzene				***1.296E-06***	***2.205E-05***		***4.188E+00***
Chlorobenzene				***7.453E-08***	***1.660E-06***		***4.190E+00***
2-Chloronaphthalene				***2.002E-07***	***4.459E-06***		***4.194E+00***
Carbon Dioxide				2.311E+01	5.136E+02		7.847E+04
Cesium Acetate							1.972E+02
Cesium Glycolate				6.292E-02	1.401E+00		
Dibenz[a,h]anthracene				***4.948E-05***	***1.102E-03***		***4.191E+00***
1,2-dibromoethane				***1.791E-06***	***3.989E-05***		***2.806E+01***
Diethyl phthalate				***2.691E-04***	***5.992E-03***		***4.202E+00***
Iron (III) Oxalate				2.528E-02	3.730E-02	1.343E+00	
Iron (III) Citrate							
Iron (III) Hydrogen EDTA				5.554E-01	1.097E+01		
Iron (III) Hydroxide	1.377E+01			3.613E-02	2.919E+01	1.547E+02	
Formic Acid, dimer							
Hydrofluoride, dimer							
2,2'-Iminobisacetic acid				3.334E-01	7.425E+00		1.132E+03
Water	1.402E+04	9.980E+02	4.493E+04	5.997E+02	7.570E+04	3.361E+06	3.290E+06
Sulfuric Acid							
Hydrogen Chloride				3.515E+00	7.828E+01	1.862E+04	
Formic Acid				1.166E-01	2.597E+00		3.961E+02
Hydrofluoric Acid				8.527E-01	1.559E+01	2.116E+01	3.388E+03
Mercury (II) Chloride							
Mercury (elemental)				***1.707E-07***	***3.801E-06***		
Mercury (II) Oxide				***1.943E-02***	***9.851E-01***		***1.361E+02***
Nitrous (III) Acid				4.193E+01	9.338E+02	3.708E+03	9.342E+04
Nitric Acid	1.899E+03			1.877E+01	2.317E+03	1.888E+03	4.525E+04
Hexachlorobutadiene				***1.562E-09***	***3.479E-08***		***4.200E+00***
Potassium Citrate				8.313E-01	1.851E+01		2.823E+03
Potassium Acetate							2.195E+02
Potassium Chloride				1.000E+01	2.227E+02	1.845E+04	1.350E+03

Stream	Total Acid	Caustic Rinse	Total C Rinse	Acc1 Recycle	Total Recycle	HLW OG Cond	Evap Feed
Potassium Glycolate				1.528E+00	3.402E+01		
Potassium Nitrate (VI)							2.357E+04
gamma-BHC (Lindane)				***4.351E-06***	***9.689E-05***		***4.209E+00***
4-methyl-2-pentanone (MIBK)				***8.308E-07***	***1.850E-05***		***4.197E+00***
Magnesium Oxalate						2.060E+00	
Magnesium Dichromate (VI)				9.765E-07	1.612E-04		
Magnesium Hydroxide	6.449E-01			1.653E-06	6.448E-01	2.368E+02	
Manganese (II) Orthophosphate							
Manganese (II) Oxalate				3.858E-04	1.182E-01		
Manganese (II) Hydroxide	8.152E-01				7.470E-01		
Nitrogen				1.713E-07	3.815E-06		
Sodium Oxalate				1.364E+00	2.103E+00		1.433E+04
Sodium Chromate (VI)				2.108E+00	5.125E+01		8.349E+03
Sodium Fluoride Sulfate							
Sodium Acetate							
Sodium Glycolate							4.556E+03
Sodium Nitrite						3.054E+03	6.342E+04
Sodium Hydroxide	6.946E+00	4.000E+00	1.801E+02	1.376E+02	4.790E+03	2.572E+04	3.253E+05
Naphthalene				2.203E-07	4.906E-06		4.188E+00
Sodium Aluminosilicate Gel				2.971E-01	8.103E+01	2.920E+03	
Nickel Orthophosphate							
Nickel (II) Oxalate				1.163E-03	3.977E+00		
Nickel (II) Hydroxide	2.496E+00						
Oxygen				9.531E-08	2.122E-06		
Phosphorus Pentoxide				1.882E-01	4.191E+00		6.391E+02
PYRENE				6.842E-06	1.524E-04		4.202E+00
Silicon Dioxide	1.640E+00			2.422E-01	3.561E+00	3.339E+02	
Sulfur Trioxide				1.286E+01	2.021E+02	5.781E+02	4.702E+04
1,2,4-trichlorobenzene				4.652E-08	1.036E-06		4.193E+00
1,2,3-trichloropropane				3.279E-07	7.301E-06		4.198E+00
TOLUENE				2.889E-08	6.433E-07		4.194E+00
Zinc Dichloride Pentoxide						9.198E+00	
Zinc Oxalate				3.355E-01	7.471E+00		
Zinc Hydroxide						7.281E+02	
Zirconium EDTA				4.461E-03	1.634E+00		
Zirconium Oxide	4.920E+00				4.421E+00		
Total g/hr	1.597E+04	1.002E+03	4.511E+04	8.598E+02	8.526E+04	3.438E+06	4.012E+06
Volume, L/hr	1.501E+01	1.001E+00	4.505E+01	6.999E-01	7.946E+01	3.405E+03	3.551E+03
Enthalpy, cal/hr	-5.475E+07	-3.796E+06	-1.709E+08	-2.855E+06	-3.074E+08	-1.289E+10	-1.404E+10
Vapor fraction							
Solid fraction				7.960E-05	2.782E-04	1.181E-04	2.238E-04
Organic fraction							
Osmotic Pres, atm	9.744E+01	4.622E+00	4.622E+00	2.223E+02	6.077E+01	1.256E+01	9.071E+01
Redox Pot, volts							
E-Con, 1/ohm-cm	5.395E-01	2.233E-02	2.233E-02	2.249E-01	1.235E-01	2.639E-02	1.378E-01
E-Con, cm2/ohm-mol	2.691E+02	2.235E+02	2.235E+02	2.899E+01	4.880E+01	9.004E+01	6.830E+01
Abs Visc, cP	9.672E-01	9.101E-01	9.101E-01	2.637E+00	1.150E+00	9.062E-01	1.494E+00
Rel Visc	1.086E+00	1.022E+00	1.022E+00	2.961E+00	1.291E+00	1.017E+00	1.678E+00
Ionic Strength	2.114E+00	1.002E-01	1.002E-01	5.949E+00	1.596E+00	2.815E-01	3.062E+00

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case[8]

Stream	Air Inleakage	EVAP REDRXN OUT	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott	UF1 Filtrate	UF1 Slurry	CWash-In
Phase	Vapor	Mixed	Mixed	Vapor	Mixed	Mixed	Aqueous	Mixed	Aqueous
Temperature, C	25	50	50	50	50	25	25	25	25
Pressure, atm	1	0.108335	0.102137	0.102137	0.102137	1	1	1	1
pH		12.6386	13.1314		13.1314	14.034	14.034	14.034	11.9511
Total mol/hr	135.18	393540	393679	321648	72031	71852.2	66180.6	5671.64	55.346
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer		1.584E-18	1.194E-18	1.194E-18					
Acetic Acid		2.804E-06	2.715E-06	2.715E-06					
Aluminum Oxide		4.704E+03	4.740E+03		4.740E+03	4.737E+03	4.375E+03	3.615E+02	
Aldrin		***4.195E+00***	***4.195E+00***	***4.189E+00***	***5.701E-03***	***5.701E-03***	***5.266E-03***	***4.351E-04***	
Aluminum Hydrogen EDTA		1.209E+03	1.208E+03		1.208E+03	1.188E+03	1.097E+03	9.067E+01	
Aluminum Hydroxide									
Benzene		***4.194E+00***	***4.194E+00***	***4.194E+00***	***2.799E-05***	***2.799E-05***	***2.585E-05***	***2.136E-06***	
Bis(2-ethylhexyl)phthalate (BEHP)		***4.194E+00***	***4.194E+00***	***4.119E+00***	***7.548E-02***	***7.548E-02***	***6.972E-02***	***5.760E-03***	
Benzo(a)pyrene (BaP)		***4.181E+00***	***4.181E+00***		***4.181E+00***	***4.181E+00***	***5.716E-04***	***4.181E+00***	
Phenol		***4.249E+00***	***4.249E+00***	***4.512E-03***	***4.245E+00***	***4.245E+00***	***3.921E+00***	***3.239E-01***	
Calcium Chloride Oxide									
Calcium Oxalate		2.141E+02	3.096E+02		3.096E+02	6.266E+02	5.788E+02	4.782E+01	
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Citrate									
Calcium Fluoride		1.660E+03	1.601E+03		1.601E+03	1.408E+03		1.408E+03	
Calcium Hydroxide									
Pentachlorophenol		***4.197E+00***	***4.197E+00***	***4.106E+00***	***9.188E-02***	***9.188E-02***	***8.487E-02***	***7.012E-03***	
Hexachlorobenzene		***4.188E+00***	***4.188E+00***		***4.188E+00***	***4.188E+00***	***1.364E-03***	***4.186E+00***	
Chlorobenzene		***4.190E+00***	***4.190E+00***	***4.190E+00***	***6.003E-05***	***6.003E-05***	***5.545E-05***	***4.581E-06***	
2-Chloronaphthalene		***4.194E+00***	***4.194E+00***	***4.194E+00***	***1.613E-04***	***1.613E-04***	***1.490E-04***	***1.231E-05***	
Carbon Dioxide	1.949E+00	7.948E+04	7.948E+04	5.045E-02	7.948E+04	7.948E+04	7.341E+04	6.065E+03	
Cesium Acetate		1.998E+02	1.998E+02		1.998E+02	1.998E+02	1.845E+02	1.524E+01	
Cesium Glycolate									
Dibenz[a,h]anthracene		***4.191E+00***	***4.191E+00***	***4.150E+00***	***4.114E-02***	***4.114E-02***	***3.800E-02***	***3.140E-03***	
1,2-dibromoethane		***2.806E+01***	***2.806E+01***	***2.806E+01***	***1.443E-03***	***1.443E-03***	***1.333E-03***	***1.101E-04***	
Diethyl phthalate		***4.205E+00***	***4.205E+00***	***3.945E+00***	***2.601E-01***	***2.601E-01***	***2.403E-01***	***1.985E-02***	
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA		5.994E+02	5.994E+02		5.994E+02	5.994E+02	5.537E+02	4.574E+01	
Iron (III) Hydroxide									
Formic Acid, dimer		7.829E-25	6.209E-25	6.209E-25					
Hydrofluoride, dimer		2.203E-22	1.184E-22	1.184E-22					
2,2'-Iminobisacetic acid		1.147E+03	1.147E+03		1.147E+03	1.147E+03	1.059E+03	8.752E+01	
Water	1.819E+01	6.789E+06	6.790E+06	5.792E+06	9.977E+05	1.001E+06	9.246E+05	7.639E+04	9.969E+02
Sulfuric Acid									
Hydrogen Chloride		1.041E+04	1.041E+04	4.263E-11	1.041E+04	1.041E+04	9.617E+03	7.945E+02	
Formic Acid		4.011E+02	4.011E+02	3.091E-07	4.011E+02	4.011E+02	3.705E+02	3.061E+01	
Hydrofluoric Acid		3.023E+03	3.053E+03	1.450E-07	3.053E+03	1.345E+03	1.242E+03	1.026E+02	
Mercury (II) Chloride		2.442E-07	1.603E-07	1.603E-07					
Mercury (elemental)		6.374E+01	6.374E+01	6.374E+01	1.380E-04	1.380E-04	1.275E-04	1.053E-05	
Mercury (II) Oxide		6.878E+01	6.878E+01		6.878E+01	6.878E+01	1.794E+01	5.084E+01	
Nitrous (III) Acid		9.653E+04	9.378E+04	6.469E-03	9.378E+04	9.330E+04	8.618E+04	7.120E+03	
Nitric Acid		6.653E+04	6.653E+04	3.522E-12	6.653E+04	6.653E+04	6.145E+04	5.077E+03	
Hexachlorobutadiene		***4.200E+00***	***4.200E+00***	***4.200E+00***	***1.259E-06***	***1.259E-06***	***1.163E-06***	***9.605E-08***	
Potassium Citrate		2.859E+03	2.859E+03		2.859E+03	2.859E+03	2.641E+03	2.182E+02	
Potassium Acetate									

Stream	Air Inleakage	EVAP REDRXN OUT	Evap Contents	Overhead	Evap Bottoms	Cooled Evap Bott	UF1 Filtrate	UF1 Slurry	CWash-In
Potassium Chloride		3.783E+04	3.783E+04		3.783E+04	3.783E+04	3.494E+04	2.887E+03	
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)		***4.209E+00***	***4.209E+00***	***4.205E+00***	***3.515E-03***	***3.515E-03***	***3.246E-03***	***2.682E-04***	
4-methyl-2-pentanone (MIBK)		***4.197E+00***	***4.197E+00***	***4.196E+00***	***6.694E-04***	***6.694E-04***	***6.184E-04***	***5.109E-05***	
Magnesium Oxalate		2.956E-02	1.704E-02		1.704E-02	2.043E-03	1.887E-03	1.559E-04	
Magnesium Dichromate (VI)									
Magnesium Hydroxide		2.391E+02	2.391E+02		2.391E+02	2.392E+02		2.392E+02	
Manganese (II) Oxalate		2.679E+00	2.679E+00		2.679E+00	2.679E+00	2.474E+00	2.044E-01	
Manganese (II) Hydroxide									
Nitrogen	2.970E+03	1.743E-06	2.970E+03	2.970E+03	1.379E-04	1.379E-04	1.274E-04	1.053E-05	
Sodium Oxalate		1.382E+04	1.372E+04		1.372E+04	1.339E+04	1.480E+03	1.191E+04	
Sodium Chromate (VI)		8.456E+03	8.456E+03		8.456E+03	8.456E+03	7.811E+03	6.453E+02	
Sodium Fluoride Sulfate						1.662E+04		1.662E+04	
Sodium Acetate		1.859E+02	1.859E+02		1.859E+02	1.859E+02	1.717E+02	1.418E+01	
Sodium Glycolate		4.615E+03	4.615E+03		4.615E+03	4.615E+03	4.263E+03	3.522E+02	
Sodium Nitrite		7.001E+04	7.404E+04		7.404E+04	7.474E+04	6.903E+04	5.703E+03	
Sodium Hydroxide		3.563E+05	3.540E+05		3.540E+05	3.430E+05	3.168E+05	2.617E+04	3.999E-01
Naphthalene		***4.188E+00***	***4.188E+00***	***4.188E+00***	***1.775E-04***	***1.775E-04***	***1.639E-04***	***1.354E-05***	
Sodium Aluminosilicate Gel		3.894E+03	3.759E+03		3.759E+03	3.784E+03		3.784E+03	
Nickel (II) Oxalate		8.077E+00	8.077E+00		8.077E+00	8.077E+00	7.461E+00	6.164E-01	
Nickel (II) Hydroxide									
Oxygen	8.994E+02	9.698E-07	8.994E+02	8.994E+02	7.674E-05	7.674E-05	7.088E-05	5.856E-06	
Phosphorus Pentoxide		6.473E+02	6.473E+02		6.473E+02	6.473E+02	5.979E+02	4.940E+01	
PYRENE		***4.202E+00***	***4.202E+00***	***4.196E+00***	***5.536E-03***	***5.536E-03***	***5.114E-03***	***4.225E-04***	
Silicon Dioxide		1.102E+02	1.589E+02		1.589E+02	1.502E+02	1.387E+02	1.146E+01	
Sulfur Trioxide		4.770E+04	4.770E+04		4.770E+04	4.047E+04	3.738E+04	3.088E+03	
1,2,4-trichlorobenzene		***4.193E+00***	***4.193E+00***	***4.193E+00***	***3.747E-05***	***3.747E-05***	***3.461E-05***	***2.859E-06***	
1,2,3-trichloropropane		***4.198E+00***	***4.198E+00***	***4.198E+00***	***2.641E-04***	***2.641E-04***	***2.440E-04***	***2.016E-05***	
TOLUENE		***4.194E+00***	***4.194E+00***	***4.194E+00***	***2.327E-05***	***2.327E-05***	***2.149E-05***	***1.776E-06***	
Zinc Dichloride Pentoxide									
Zinc Oxalate		1.154E+03	1.154E+03		1.154E+03	1.154E+03	1.066E+03	8.805E+01	
Zinc Hydroxide									
Zirconium EDTA		6.570E+00	7.143E+00		7.143E+00	3.098E+01	2.861E+01	2.364E+00	
Zirconium Oxide		7.926E+00	7.740E+00		7.740E+00				
Total g/hr	3.889E+03	7.603E+06	7.607E+06	5.796E+06	1.811E+06	1.811E+06	1.641E+06	1.695E+05	9.973E+02
Volume, L/hr	3.307E+03	6.703E+07	8.341E+07	8.341E+07	1.368E+03	1.319E+03	1.216E+03	1.039E+02	1.000E+00
Enthalpy, cal/hr	-6.275E+04	-2.450E+10	-2.402E+10	-1.852E+10	-5.498E+09	-5.522E+09	-5.017E+09	-5.049E+08	-3.781E+06
Vapor fraction	1.000E+00	6.967E-01	8.170E-01	1.000E+00					
Solid fraction		1.349E-04	2.539E-04		1.387E-03	2.838E-03		3.596E-02	
Organic fraction									
Osmotic Pres, atm		1.801E+02	2.724E+02		2.724E+02	2.716E+02	2.716E+02	2.716E+02	4.741E-01
Redox Pot, volts									
E-Con, 1/ohm-cm		2.765E-01	3.799E-01		3.799E-01	2.596E-01			2.366E-03
E-Con, cm2/ohm-mol		3.659E+01	3.077E+01		3.077E+01	2.052E+01			2.367E+02
Abs Visc, cP		1.449E+00	2.382E+00		2.382E+00	4.188E+00			8.929E-01
Rel Visc		2.648E+00	4.353E+00		4.353E+00	4.701E+00			1.002E+00
Ionic Strength		5.935E+00	1.052E+01		1.052E+01	9.970E+00	9.970E+00	9.970E+00	1.003E-02

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	Total CWash	FCWash Total	SCWash Total	FCWash-1	FCWash-2	FCWash-3	FCWash-4	FCWash-5	SCWash-1
Phase	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511	11.9511
Total mol/hr	55.346	27.673	27.673	5.5346	5.5346	5.5346	5.5346	5.5346	5.5346
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide									
Aldrin									
Aluminum Hydrogen EDTA									
Aluminum Hydroxide									
Benzene									
Bis(2-ethylhexyl)phthalate (BEHP)									
Benzo(a)pyrene (BaP)									
Phenol									
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Citrate									
Calcium Fluoride									
Calcium Hydroxide									
Pentachlorophenol									
Hexachlorobenzene									
Chlorobenzene									
2-Chloronaphthalene									
Carbon Dioxide									
Cesium Acetate									
Cesium Glycolate									
Dibenz[a,h]anthracene									
1,2-dibromoethane									
Diethyl phthalate									
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA									
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid									
Water	9.969E+02	4.984E+02	4.984E+02	9.969E+01	9.969E+01	9.969E+01	9.969E+01	9.969E+01	9.969E+01
Sulfuric Acid									
Hydrogen Chloride									
Formic Acid									
Hydrofluoric Acid									
Mercury (II) Chloride									
Mercury (elemental)									
Mercury (II) Oxide									
Nitrous (III) Acid									
Nitric Acid									
Hexachlorobutadiene									
Potassium Citrate									
Potassium Acetate									
Potassium Chloride									

Stream	Total CWash	FCWash Total	SCWash Total	FCWash-1	FCWash-2	FCWash-3	FCWash-4	FCWash-5	SCWash-1
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)									
4-methyl-2-pentanone (MIBK)									
Magnesium Oxalate									
Magnesium Dichromate (VI)									
Magnesium Hydroxide									
Manganese (II) Oxalate									
Manganese (II) Hydroxide									
Nitrogen									
Sodium Oxalate									
Sodium Chromate (VI)									
Sodium Fluoride Sulfate									
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide	3.999E-01	1.999E-01	1.999E-01	3.999E-02	3.999E-02	3.999E-02	3.999E-02	3.999E-02	3.999E-02
Naphthalene									
Sodium Aluminosilicate Gel									
Nickel (II) Oxalate									
Nickel (II) Hydroxide									
Oxygen									
Phosphorus Pentoxide									
PYRENE									
Silicon Dioxide									
Sulfur Trioxide									
1,2,4-trichlorobenzene									
1,2,3-trichloropropane									
TOLUENE									
Zinc Dichloride Pentoxide									
Zinc Oxalate									
Zinc Hydroxide									
Zirconium EDTA									
Zirconium Oxide									
Total g/hr	9.973E+02	4.986E+02	4.986E+02	9.973E+01	9.973E+01	9.973E+01	9.973E+01	9.973E+01	9.973E+01
Volume, L/hr	1.000E+00	5.000E-01	5.000E-01	1.000E-01	1.000E-01	1.000E-01	1.000E-01	1.000E-01	1.000E-01
Enthalpy, cal/hr	-3.781E+06	-1.891E+06	-1.891E+06	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05
Vapor fraction									
Solid fraction									
Organic fraction									
Osmotic Pres, atm	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01	4.741E-01
Redox Pot, volts									
E-Con, 1/ohm-cm	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.366E-03
E-Con, cm2/ohm-mol	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02	2.367E+02
Abs Visc, cP	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01	8.929E-01
Rel Visc	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00	1.002E+00
Ionic Strength	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02	1.003E-02

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	SCWash-2	SCWash-3	SCWash-4	SCWash-5	FCWash Slurry	FCW1 Liquor	FCW1 Solids	FCW1 Recycle	FCW1 Return
Phase	Aqueous	Aqueous	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	11.9511	11.9511	11.9511	11.9511	14.0328	14.0328		14.0328	14.0328
Total mol/hr	5.5346	5.5346	5.5346	5.5346	5677.21	5473.3	203.912	5.44456	5467.86
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide					3.614E+02	3.614E+02		3.595E-01	3.611E+02
Aldrin					***4.351E-04***	***4.351E-04***		***4.328E-07***	***4.346E-04***
Aluminum Hydrogen EDTA					9.067E+01	9.067E+01		9.020E-02	9.058E+01
Aluminum Hydroxide									
Benzene					***2.136E-06***	***2.136E-06***		***2.125E-09***	***2.134E-06***
Bis(2-ethylhexyl)phthalate (BEHP)					***5.760E-03***	***5.760E-03***		***5.730E-06***	***5.755E-03***
Benzo(a)pyrene (BaP)					***4.181E+00***	***4.735E-05***	***4.181E+00***	***4.710E-08***	***4.730E-05***
Phenol					***3.239E-01***	***3.239E-01***		***3.222E-04***	***3.236E-01***
Calcium Chloride Oxide									
Calcium Oxalate					4.779E+01	4.778E+01		4.753E-02	4.774E+01
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Citrate									
Calcium Fluoride					1.408E+03		1.408E+03		
Calcium Hydroxide									
Pentachlorophenol					***7.012E-03***	***7.012E-03***		***6.975E-06***	***7.005E-03***
Hexachlorobenzene					***4.186E+00***	***1.130E-04***	***4.186E+00***	***1.124E-07***	***1.129E-04***
Chlorobenzene					***4.581E-06***	***4.581E-06***		***4.557E-09***	***4.577E-06***
2-Chloronaphthalene					***1.231E-05***	***1.231E-05***		***1.225E-08***	***1.230E-05***
Carbon Dioxide					6.065E+03	6.065E+03		6.033E+00	6.059E+03
Cesium Acetate					1.524E+01	1.524E+01		1.516E-02	1.523E+01
Cesium Glycolate									
Dibenz[a,h]anthracene					***3.140E-03***	***3.140E-03***		***3.123E-06***	***3.137E-03***
1,2-dibromoethane					***1.101E-04***	***1.101E-04***		***1.095E-07***	***1.100E-04***
Diethyl phthalate					***1.985E-02***	***1.985E-02***		***1.975E-05***	***1.983E-02***
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA					4.574E+01	4.574E+01		4.550E-02	4.570E+01
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid					8.752E+01	8.752E+01		8.706E-02	8.743E+01
Water	9.969E+01	9.969E+01	9.969E+01	9.969E+01	7.649E+04	7.649E+04		7.609E+01	7.641E+04
Sulfuric Acid									
Hydrogen Chloride					7.945E+02	7.945E+02		7.904E-01	7.937E+02
Formic Acid					3.061E+01	3.061E+01		3.045E-02	3.058E+01
Hydrofluoric Acid					1.030E+02	1.030E+02		1.024E-01	1.029E+02
Mercury (II) Chloride									
Mercury (elemental)					1.053E-05	1.053E-05		1.048E-08	1.052E-05
Mercury (II) Oxide					5.084E+01	1.483E+00	4.936E+01	1.475E-03	1.482E+00
Nitrous (III) Acid					7.120E+03	7.120E+03		7.083E+00	7.113E+03
Nitric Acid					5.077E+03	5.077E+03		5.050E+00	5.072E+03
Hexachlorobutadiene					***9.605E-08***	***9.605E-08***		***9.554E-11***	***9.595E-08***
Potassium Citrate					2.182E+02	2.182E+02		2.171E-01	2.180E+02
Potassium Acetate									
Potassium Chloride					2.887E+03	2.887E+03		2.872E+00	2.884E+03

Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)					***2.682E-04***	***2.682E-04***		***2.668E-07***	***2.680E-04***
4-methyl-2-pentanone (MIBK)					***5.109E-05***	***5.109E-05***		***5.082E-08***	***5.104E-05***
Magnesium Oxalate					1.571E-04	1.571E-04		1.563E-07	1.569E-04
Magnesium Dichromate (VI)									
Magnesium Hydroxide					2.392E+02		2.392E+02		
Manganese (II) Oxalate					2.044E-01	2.044E-01		2.033E-04	2.042E-01
Manganese (II) Hydroxide									
Nitrogen					1.053E-05	1.053E-05		1.047E-08	1.052E-05
Sodium Oxalate					1.191E+04	1.227E+02	1.178E+04	1.221E-01	1.226E+02
Sodium Chromate (VI)					6.453E+02	6.453E+02		6.419E-01	6.447E+02
Sodium Fluoride Sulfate					1.662E+04		1.662E+04		
Sodium Acetate					1.418E+01	1.418E+01		1.411E-02	1.417E+01
Sodium Glycolate					3.522E+02	3.522E+02		3.503E-01	3.518E+02
Sodium Nitrite					5.704E+03	5.704E+03		5.674E+00	5.698E+03
Sodium Hydroxide	3.999E-02	3.999E-02	3.999E-02	3.999E-02	2.618E+04	2.618E+04		2.604E+01	2.615E+04
Naphthalene					***1.354E-05***	***1.354E-05***		***1.347E-08***	***1.353E-05***
Sodium Aluminosilicate Gel					3.784E+03		3.784E+03		
Nickel (II) Oxalate					6.164E-01	6.164E-01		6.132E-04	6.158E-01
Nickel (II) Hydroxide									
Oxygen					5.856E-06	5.856E-06		5.826E-09	5.851E-06
Phosphorus Pentoxide					4.940E+01	4.940E+01		4.914E-02	4.935E+01
PYRENE					***4.225E-04***	***4.225E-04***		***4.203E-07***	***4.221E-04***
Silicon Dioxide					1.143E+01	1.143E+01		1.137E-02	1.142E+01
Sulfur Trioxide					3.090E+03	3.090E+03		3.074E+00	3.087E+03
1,2,4-trichlorobenzene					***2.859E-06***	***2.859E-06***		***2.844E-09***	***2.857E-06***
1,2,3-trichloropropane					***2.016E-05***	***2.016E-05***		***2.005E-08***	***2.014E-05***
TOLUENE					***1.776E-06***	***1.776E-06***		***1.766E-09***	***1.774E-06***
Zinc Dichloride Pentoxide									
Zinc Oxalate					8.805E+01	8.805E+01		8.759E-02	8.796E+01
Zinc Hydroxide									
Zirconium EDTA					2.364E+00	2.364E+00		2.351E-03	2.361E+00
Zirconium Oxide									
Total g/hr	9.973E+01	9.973E+01	9.973E+01	9.973E+01	1.696E+05	1.357E+05	3.389E+04	1.350E+02	1.356E+05
Volume, L/hr	1.000E-01	1.000E-01	1.000E-01	1.000E-01	1.040E+02	1.005E+02	3.430E+00	1.000E-01	1.004E+02
Enthalpy, cal/hr	-3.781E+05	-3.781E+05	-3.781E+05	-3.781E+05	-5.053E+08	-4.149E+08	-9.038E+07	-4.127E+05	-4.145E+08
Vapor fraction									
Solid fraction					3.592E-02		1.000E+00		
Organic fraction									
Osmotic Pres, atm	4.741E-01	4.741E-01	4.741E-01	4.741E-01	2.713E+02	2.713E+02		2.713E+02	2.713E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.366E-03	2.366E-03	2.366E-03	2.366E-03	2.595E-01	2.595E-01		2.595E-01	2.595E-01
E-Con, cm2/ohm-mol	2.367E+02	2.367E+02	2.367E+02	2.367E+02	1.823E+01	1.823E+01		1.823E+01	1.823E+01
Abs Visc, cP	8.929E-01	8.929E-01	8.929E-01	8.929E-01	4.183E+00	4.183E+00		4.183E+00	4.183E+00
Rel Visc	1.002E+00	1.002E+00	1.002E+00	1.002E+00	4.696E+00	4.696E+00		4.696E+00	4.696E+00
Ionic Strength	1.003E-02	1.003E-02	1.003E-02	1.003E-02	9.959E+00	9.959E+00		9.959E+00	9.959E+00

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	FCW2 Slurry	FCW2 Liquor	FCW2 Solids	FCW2 Recycle	FCW2 Return	FCW3 Slurry	FCW3 Liquor	FCW3 Solids	FCW3 Recycle
Phase	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	14.0316	14.0316		14.0316	14.0316	14.0304	14.0304		14.0304
Total mol/hr	5677.34	5473.45	203.891	5.44478	5468	5677.46	5473.59	203.871	5.445
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide	3.611E+02	3.611E+02		3.592E-01	3.607E+02	3.607E+02	3.607E+02		3.588E-01
Aldrin	***4.346E-04***	***4.346E-04***		***4.323E-07***	***4.342E-04***	***4.342E-04***	***4.342E-04***		***4.319E-07***
Aluminum Hydrogen EDTA	9.058E+01	9.058E+01		9.011E-02	9.049E+01	9.049E+01	9.049E+01		9.002E-02
Aluminum Hydroxide									
Benzene	***2.134E-06***	***2.134E-06***		***2.123E-09***	***2.132E-06***	***2.132E-06***	***2.132E-06***		***2.120E-09***
Bis(2-ethylhexyl)phthalate (BEHP)	***5.755E-03***	***5.755E-03***		***5.725E-06***	***5.749E-03***	***5.749E-03***	***5.749E-03***		***5.719E-06***
Benzo(a)pyrene (BaP)	***4.181E+00***	***4.743E-05***	***4.181E+00***	***4.718E-08***	***4.738E-05***	***4.181E+00***	***4.751E-05***	***4.181E+00***	***4.726E-08***
Phenol	***3.236E-01***	***3.236E-01***		***3.219E-04***	***3.233E-01***	***3.233E-01***	***3.233E-01***		***3.216E-04***
Calcium Chloride Oxide									
Calcium Oxalate	4.770E+01	4.770E+01		4.745E-02	4.765E+01	4.762E+01	4.762E+01		4.737E-02
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Citrate									
Calcium Fluoride	1.408E+03		1.408E+03			1.408E+03		1.408E+03	
Calcium Hydroxide									
Pentachlorophenol	***7.005E-03***	***7.005E-03***		***6.968E-06***	***6.998E-03***	***6.998E-03***	***6.998E-03***		***6.961E-06***
Hexachlorobenzene	***4.186E+00***	***1.132E-04***	***4.186E+00***	***1.126E-07***	***1.131E-04***	***4.186E+00***	***1.134E-04***	***4.186E+00***	***1.128E-07***
Chlorobenzene	***4.577E-06***	***4.577E-06***		***4.553E-09***	***4.572E-06***	***4.572E-06***	***4.572E-06***		***4.548E-09***
2-Chloronaphthalene	***1.230E-05***	***1.230E-05***		***1.223E-08***	***1.229E-05***	***1.229E-05***	***1.229E-05***		***1.222E-08***
Carbon Dioxide	6.059E+03	6.059E+03		6.027E+00	6.053E+03	6.053E+03	6.053E+03		6.021E+00
Cesium Acetate	1.523E+01	1.523E+01		1.515E-02	1.521E+01	1.521E+01	1.521E+01		1.513E-02
Cesium Glycolate									
Dibenz[a,h]anthracene	***3.137E-03***	***3.137E-03***		***3.120E-06***	***3.134E-03***	***3.134E-03***	***3.134E-03***		***3.117E-06***
1,2-dibromoethane	***1.100E-04***	***1.100E-04***		***1.094E-07***	***1.099E-04***	***1.099E-04***	***1.099E-04***		***1.093E-07***
Diethyl phthalate	***1.983E-02***	***1.983E-02***		***1.973E-05***	***1.981E-02***	***1.981E-02***	***1.981E-02***		***1.971E-05***
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA	4.570E+01	4.570E+01		4.546E-02	4.565E+01	4.565E+01	4.565E+01		4.541E-02
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	8.743E+01	8.743E+01		8.697E-02	8.734E+01	8.734E+01	8.734E+01		8.689E-02
Water	7.651E+04	7.651E+04		7.611E+01	7.644E+04	7.654E+04	7.654E+04		7.614E+01
Sulfuric Acid									
Hydrogen Chloride	7.937E+02	7.937E+02		7.896E-01	7.930E+02	7.930E+02	7.930E+02		7.888E-01
Formic Acid	3.058E+01	3.058E+01		3.042E-02	3.055E+01	3.055E+01	3.055E+01		3.039E-02
Hydrofluoric Acid	1.032E+02	1.032E+02		1.027E-01	1.031E+02	1.035E+02	1.035E+02		1.030E-01
Mercury (II) Chloride									
Mercury (elemental)	1.052E-05	1.052E-05		1.046E-08	1.051E-05	1.051E-05	1.051E-05		1.045E-08
Mercury (II) Oxide	5.084E+01	1.483E+00	4.935E+01	1.475E-03	1.481E+00	5.084E+01	1.483E+00	4.935E+01	1.475E-03
Nitrous (III) Acid	7.113E+03	7.113E+03		7.075E+00	7.105E+03	7.105E+03	7.105E+03		7.068E+00
Nitric Acid	5.072E+03	5.072E+03		5.045E+00	5.067E+03	5.067E+03	5.067E+03		5.040E+00
Hexachlorobutadiene	***9.595E-08***	***9.595E-08***		***9.545E-11***	***9.586E-08***	***9.586E-08***	***9.586E-08***		***9.536E-11***
Potassium Citrate	2.180E+02	2.180E+02		2.168E-01	2.178E+02	2.178E+02	2.178E+02		2.166E-01
Potassium Acetate									
Potassium Chloride	2.884E+03	2.884E+03		2.869E+00	2.881E+03	2.881E+03	2.881E+03		2.866E+00

Stream	FCW2 Slurry	FCW2 Liquor	FCW2 Solids	FCW2 Recycle	FCW2 Return	FCW3 Slurry	FCW3 Liquor	FCW3 Solids	FCW3 Recycle
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***2.680E-04***	***2.680E-04***		***2.665E-07***	***2.677E-04***	***2.677E-04***	***2.677E-04***		***2.663E-07***
4-methyl-2-pentanone (MIBK)	***5.104E-05***	***5.104E-05***		***5.077E-08***	***5.099E-05***	***5.099E-05***	***5.099E-05***		***5.072E-08***
Magnesium Oxalate	1.581E-04	1.581E-04		1.573E-07	1.579E-04	1.591E-04	1.591E-04		1.583E-07
Magnesium Dichromate (VI)									
Magnesium Hydroxide	2.392E+02		2.392E+02			2.392E+02		2.392E+02	
Manganese (II) Oxalate	2.042E-01	2.042E-01		2.031E-04	2.040E-01	2.040E-01	2.040E-01		2.029E-04
Manganese (II) Hydroxide									
Nitrogen	1.052E-05	1.052E-05		1.046E-08	1.050E-05	1.050E-05	1.050E-05		1.045E-08
Sodium Oxalate	1.191E+04	1.230E+02	1.178E+04	1.223E-01	1.228E+02	1.191E+04	1.232E+02	1.178E+04	1.226E-01
Sodium Chromate (VI)	6.447E+02	6.447E+02		6.413E-01	6.440E+02	6.440E+02	6.440E+02		6.407E-01
Sodium Fluoride Sulfate	1.662E+04		1.662E+04			1.661E+04		1.661E+04	
Sodium Acetate	1.417E+01	1.417E+01		1.410E-02	1.416E+01	1.416E+01	1.416E+01		1.408E-02
Sodium Glycolate	3.518E+02	3.518E+02		3.500E-01	3.515E+02	3.515E+02	3.515E+02		3.496E-01
Sodium Nitrite	5.699E+03	5.699E+03		5.669E+00	5.693E+03	5.694E+03	5.694E+03		5.664E+00
Sodium Hydroxide	2.615E+04	2.615E+04		2.602E+01	2.613E+04	2.613E+04	2.613E+04		2.599E+01
Naphthalene	***1.353E-05***	***1.353E-05***		***1.346E-08***	***1.352E-05***	***1.352E-05***	***1.352E-05***		***1.345E-08***
Sodium Aluminosilicate Gel	3.784E+03		3.784E+03			3.784E+03		3.784E+03	
Nickel (II) Oxalate	6.158E-01	6.158E-01		6.126E-04	6.152E-01	6.152E-01	6.152E-01		6.120E-04
Nickel (II) Hydroxide									
Oxygen	5.851E-06	5.851E-06		5.820E-09	5.845E-06	5.845E-06	5.845E-06		5.814E-09
Phosphorus Pentoxide	4.935E+01	4.935E+01		4.909E-02	4.930E+01	4.930E+01	4.930E+01		4.904E-02
PYRENE	***4.221E-04***	***4.221E-04***		***4.199E-07***	***4.216E-04***	***4.216E-04***	***4.216E-04***		***4.194E-07***
Silicon Dioxide	1.140E+01	1.140E+01		1.134E-02	1.138E+01	1.136E+01	1.136E+01		1.130E-02
Sulfur Trioxide	3.088E+03	3.088E+03		3.072E+00	3.085E+03	3.087E+03	3.087E+03		3.071E+00
1,2,4-trichlorobenzene	***2.857E-06***	***2.857E-06***		***2.842E-09***	***2.854E-06***	***2.854E-06***	***2.854E-06***		***2.839E-09***
1,2,3-trichloropropane	***2.014E-05***	***2.014E-05***		***2.003E-08***	***2.012E-05***	***2.012E-05***	***2.012E-05***		***2.001E-08***
TOLUENE	***1.774E-06***	***1.774E-06***		***1.765E-09***	***1.772E-06***	***1.772E-06***	***1.772E-06***		***1.763E-09***
Zinc Dichloride Pentoxide									
Zinc Oxalate	8.796E+01	8.796E+01		8.750E-02	8.788E+01	8.788E+01	8.788E+01		8.742E-02
Zinc Hydroxide									
Zirconium EDTA	2.361E+00	2.361E+00		2.349E-03	2.359E+00	2.359E+00	2.359E+00		2.347E-03
Zirconium Oxide									
Total g/hr	1.696E+05	1.357E+05	3.389E+04	1.350E+02	1.355E+05	1.695E+05	1.356E+05	3.389E+04	1.349E+02
Volume, L/hr	1.040E+02	1.005E+02	3.430E+00	1.000E-01	1.004E+02	1.040E+02	1.005E+02	3.430E+00	1.000E-01
Enthalpy, cal/hr	-5.052E+08	-4.149E+08	-9.037E+07	-4.127E+05	-4.144E+08	-5.052E+08	-4.148E+08	-9.036E+07	-4.127E+05
Vapor fraction									
Solid fraction	3.591E-02		1.000E+00			3.591E-02		1.000E+00	
Organic fraction									
Osmotic Pres, atm	2.711E+02	2.711E+02		2.711E+02	2.711E+02	2.709E+02	2.709E+02		2.709E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.594E-01	2.594E-01		2.594E-01	2.594E-01	2.593E-01	2.593E-01		2.593E-01
E-Con, cm2/ohm-mol	1.823E+01	1.823E+01		1.823E+01	1.823E+01	1.824E+01	1.824E+01		1.824E+01
Abs Visc, cP	4.178E+00	4.178E+00		4.178E+00	4.178E+00	4.174E+00	4.174E+00		4.174E+00
Rel Visc	4.691E+00	4.691E+00		4.691E+00	4.691E+00	4.686E+00	4.686E+00		4.686E+00
Ionic Strength	9.948E+00	9.948E+00		9.948E+00	9.948E+00	9.936E+00	9.936E+00		9.936E+00

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	FCW3 Return	FCW4 Slurry	FCW4 Liquor	FCW4 Solids	FCW4 Recycle	FCW4 Return	FCWash5 Slurry	FCW5 Liquor	FCW5 Solids
Phase	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous	Solid
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	14.0304	14.0292	14.0292		14.0292	14.0292	14.028	14.028	
Total mol/hr	5468.15	5677.59	5473.74	203.85	5.44522	5468.29	5677.71	5473.88	203.829
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid									
Aluminum Oxide	3.603E+02	3.603E+02	3.603E+02		3.584E-01	3.600E+02	3.599E+02	3.599E+02	
Aldrin	***4.338E-04***	***4.338E-04***	***4.338E-04***		***4.315E-07***	***4.333E-04***	***4.333E-04***	***4.333E-04***	
Aluminum Hydrogen EDTA	9.040E+01	9.040E+01	9.040E+01		8.993E-02	9.031E+01	9.031E+01	9.031E+01	
Aluminum Hydroxide									
Benzene	***2.129E-06***	***2.129E-06***	***2.129E-06***		***2.118E-09***	***2.127E-06***	***2.127E-06***	***2.127E-06***	
Bis(2-ethylhexyl)phthalate (BEHP)	***5.743E-03***	***5.743E-03***	***5.743E-03***		***5.713E-06***	***5.738E-03***	***5.738E-03***	***5.738E-03***	
Benzo(a)pyrene (BaP)	***4.746E-05***	***4.181E+00***	***4.758E-05***	***4.181E+00***	***4.734E-08***	***4.754E-05***	***4.181E+00***	***4.766E-05***	***4.181E+00***
Phenol	***3.230E-01***	***3.230E-01***	***3.230E-01***		***3.213E-04***	***3.227E-01***	***3.227E-01***	***3.227E-01***	
Calcium Chloride Oxide									
Calcium Oxalate	4.757E+01	4.753E+01	4.753E+01		4.728E-02	4.749E+01	4.745E+01	4.745E+01	
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)									
Calcium Citrate									
Calcium Fluoride		1.408E+03		1.408E+03			1.408E+03		1.408E+03
Calcium Hydroxide									
Pentachlorophenol	***6.991E-03***	***6.991E-03***	***6.991E-03***		***6.954E-06***	***6.984E-03***	***6.984E-03***	***6.984E-03***	
Hexachlorobenzene	***1.133E-04***	***4.186E+00***	***1.136E-04***	***4.186E+00***	***1.130E-07***	***1.135E-04***	***4.186E+00***	***1.138E-04***	***4.186E+00***
Chlorobenzene	***4.568E-06***	***4.568E-06***	***4.568E-06***		***4.544E-09***	***4.563E-06***	***4.563E-06***	***4.563E-06***	
2-Chloronaphthalene	***1.227E-05***	***1.227E-05***	***1.227E-05***		***1.221E-08***	***1.226E-05***	***1.226E-05***	***1.226E-05***	
Carbon Dioxide	6.047E+03	6.047E+03	6.047E+03		6.016E+00	6.041E+03	6.041E+03	6.041E+03	
Cesium Acetate	1.520E+01	1.520E+01	1.520E+01		1.512E-02	1.518E+01	1.518E+01	1.518E+01	
Cesium Glycolate									
Dibenz[a,h]anthracene	***3.131E-03***	***3.130E-03***	***3.131E-03***		***3.114E-06***	***3.127E-03***	***3.127E-03***	***3.127E-03***	
1,2-dibromoethane	***1.098E-04***	***1.098E-04***	***1.098E-04***		***1.092E-07***	***1.097E-04***	***1.097E-04***	***1.097E-04***	
Diethyl phthalate	***1.979E-02***	***1.979E-02***	***1.979E-02***		***1.969E-05***	***1.977E-02***	***1.977E-02***	***1.977E-02***	
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA	4.561E+01	4.561E+01	4.561E+01		4.537E-02	4.556E+01	4.556E+01	4.556E+01	
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	8.726E+01	8.726E+01	8.726E+01		8.680E-02	8.717E+01	8.717E+01	8.717E+01	
Water	7.646E+04	7.656E+04	7.656E+04		7.616E+01	7.648E+04	7.658E+04	7.658E+04	
Sulfuric Acid									
Hydrogen Chloride	7.922E+02	7.922E+02	7.922E+02		7.880E-01	7.914E+02	7.914E+02	7.914E+02	
Formic Acid	3.052E+01	3.052E+01	3.052E+01		3.036E-02	3.049E+01	3.049E+01	3.049E+01	
Hydrofluoric Acid	1.034E+02	1.037E+02	1.037E+02		1.032E-01	1.036E+02	1.040E+02	1.040E+02	
Mercury (II) Chloride									
Mercury (elemental)	1.050E-05	1.050E-05	1.050E-05		1.044E-08	1.049E-05	1.049E-05	1.049E-05	
Mercury (II) Oxide	1.481E+00	5.083E+01	1.482E+00	4.935E+01	1.475E-03	1.481E+00	5.083E+01	1.482E+00	4.935E+01
Nitrous (III) Acid	7.098E+03	7.098E+03	7.098E+03		7.061E+00	7.091E+03	7.090E+03	7.090E+03	
Nitric Acid	5.062E+03	5.062E+03	5.062E+03		5.035E+00	5.057E+03	5.057E+03	5.057E+03	
Hexachlorobutadiene	***9.576E-08***	***9.576E-08***	***9.576E-08***		***9.526E-11***	***9.567E-08***	***9.567E-08***	***9.567E-08***	
Potassium Citrate	2.176E+02	2.176E+02	2.176E+02		2.164E-01	2.173E+02	2.173E+02	2.173E+02	
Potassium Acetate									
Potassium Chloride	2.878E+03	2.878E+03	2.878E+03		2.863E+00	2.875E+03	2.875E+03	2.875E+03	

Stream	FCW3 Return	FCW4 Slurry	FCW4 Liquor	FCW4 Solids	FCW4 Recycle	FCW4 Return	FCWash5 Slurry	FCW5 Liquor	FCW5 Solids
Potassium Glycolate									
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***2.674E-04***	***2.674E-04***	***2.674E-04***		***2.660E-07***	***2.672E-04***	***2.672E-04***	***2.672E-04***	
4-methyl-2-pentanone (MIBK)	***5.093E-05***	***5.093E-05***	***5.094E-05***		***5.067E-08***	***5.088E-05***	***5.088E-05***	***5.088E-05***	
Magnesium Oxalate	1.590E-04	1.602E-04	1.602E-04		1.593E-07	1.600E-04	1.612E-04	1.612E-04	
Magnesium Dichromate (VI)									
Magnesium Hydroxide		2.392E+02		2.392E+02			2.392E+02		2.392E+02
Manganese (II) Oxalate	2.038E-01	2.038E-01	2.038E-01		2.027E-04	2.036E-01	2.036E-01	2.036E-01	
Manganese (II) Hydroxide									
Nitrogen	1.049E-05	1.049E-05	1.049E-05		1.044E-08	1.048E-05	1.048E-05	1.048E-05	
Sodium Oxalate	1.231E+02	1.191E+04	1.235E+02	1.178E+04	1.228E-01	1.234E+02	1.191E+04	1.237E+02	1.178E+04
Sodium Chromate (VI)	6.434E+02	6.434E+02	6.434E+02		6.400E-01	6.427E+02	6.427E+02	6.427E+02	
Sodium Fluoride Sulfate		1.661E+04		1.661E+04			1.661E+04		1.661E+04
Sodium Acetate	1.414E+01	1.414E+01	1.414E+01		1.407E-02	1.413E+01	1.413E+01	1.413E+01	
Sodium Glycolate	3.511E+02	3.511E+02	3.511E+02		3.493E-01	3.508E+02	3.508E+02	3.508E+02	
Sodium Nitrite	5.688E+03	5.689E+03	5.689E+03		5.659E+00	5.683E+03	5.683E+03	5.683E+03	
Sodium Hydroxide	2.610E+04	2.610E+04	2.610E+04		2.597E+01	2.608E+04	2.608E+04	2.608E+04	
Naphthalene	***1.350E-05***	***1.350E-05***	***1.350E-05***		***1.343E-08***	***1.349E-05***	***1.349E-05***	***1.349E-05***	
Sodium Aluminosilicate Gel		3.784E+03		3.784E+03			3.784E+03		3.784E+03
Nickel (II) Oxalate	6.146E-01	6.146E-01	6.146E-01		6.114E-04	6.140E-01	6.140E-01	6.140E-01	
Nickel (II) Hydroxide									
Oxygen	5.839E-06	5.839E-06	5.839E-06		5.808E-09	5.833E-06	5.833E-06	5.833E-06	
Phosphorus Pentoxide	4.925E+01	4.925E+01	4.925E+01		4.900E-02	4.920E+01	4.920E+01	4.920E+01	
PYRENE	***4.212E-04***	***4.212E-04***	***4.212E-04***		***4.190E-07***	***4.208E-04***	***4.208E-04***	***4.208E-04***	
Silicon Dioxide	1.135E+01	1.132E+01	1.132E+01		1.126E-02	1.131E+01	1.128E+01	1.128E+01	
Sulfur Trioxide	3.084E+03	3.085E+03	3.085E+03		3.069E+00	3.082E+03	3.083E+03	3.083E+03	
1,2,4-trichlorobenzene	***2.851E-06***	***2.851E-06***	***2.851E-06***		***2.836E-09***	***2.848E-06***	***2.848E-06***	***2.848E-06***	
1,2,3-trichloropropane	***2.010E-05***	***2.010E-05***	***2.010E-05***		***1.999E-08***	***2.008E-05***	***2.008E-05***	***2.008E-05***	
TOLUENE	***1.770E-06***	***1.770E-06***	***1.770E-06***		***1.761E-09***	***1.769E-06***	***1.769E-06***	***1.769E-06***	
Zinc Dichloride Pentoxide									
Zinc Oxalate	8.779E+01	8.779E+01	8.779E+01		8.733E-02	8.770E+01	8.770E+01	8.770E+01	
Zinc Hydroxide									
Zirconium EDTA	2.357E+00	2.357E+00	2.357E+00		2.344E-03	2.354E+00	2.354E+00	2.354E+00	
Zirconium Oxide									
Total g/hr	1.355E+05	1.695E+05	1.356E+05	3.388E+04	1.349E+02	1.355E+05	1.694E+05	1.356E+05	3.388E+04
Volume, L/hr	1.004E+02	1.040E+02	1.005E+02	3.430E+00	1.000E-01	1.004E+02	1.040E+02	1.005E+02	3.430E+00
Enthalpy, cal/hr	-4.144E+08	-5.052E+08	-4.148E+08	-9.035E+07	-4.126E+05	-4.144E+08	-5.051E+08	-4.148E+08	-9.034E+07
Vapor fraction									
Solid fraction		3.590E-02		1.000E+00			3.590E-02		1.000E+00
Organic fraction									
Osmotic Pres, atm	2.709E+02	2.707E+02	2.707E+02		2.707E+02	2.707E+02	2.704E+02	2.704E+02	
Redox Pot, volts									
E-Con, 1/ohm-cm	2.593E-01	2.592E-01	2.592E-01		2.592E-01	2.592E-01	2.591E-01	2.591E-01	
E-Con, cm2/ohm-mol	1.824E+01	1.825E+01	1.825E+01		1.825E+01	1.825E+01	1.825E+01	1.825E+01	
Abs Visc, cP	4.174E+00	4.169E+00	4.169E+00		4.169E+00	4.169E+00	4.165E+00	4.165E+00	
Rel Visc	4.686E+00	4.681E+00	4.681E+00		4.681E+00	4.681E+00	4.676E+00	4.676E+00	
Ionic Strength	9.936E+00	9.925E+00	9.925E+00		9.925E+00	9.925E+00	9.914E+00	9.914E+00	

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	FCW5 Recycle	FCW5 Return	Leach-in	Total Leach	FCWash-Leach	Steam-in	Total Steam	UF2 Filtrate	UF2 Slurry
Phase	Aqueous	Aqueous	Aqueous	Aqueous	Mixed	Aqueous	Aqueous	Aqueous	Mixed
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	14.028	14.028	17.8006	17.8006	15.2536	6.9969	6.9969	15.1074	15.1074
Total mol/hr	5.44544	5468.43	62.1856	1320.66	6985.88	55.3332	798.187	1189.57	6588.1
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid					1.508E+01			2.378E+00	1.270E+01
Aluminum Oxide	3.581E-01	3.596E+02			1.061E+03			1.448E+02	7.732E+02
Aldrin	***4.311E-07***	***4.329E-04***			***4.329E-04***			***6.827E-05***	***3.646E-04***
Aluminum Hydrogen EDTA	8.984E-02	9.022E+01			9.022E+01			1.423E+01	7.599E+01
Aluminum Hydroxide									
Benzene	***2.116E-09***	***2.125E-06***			***2.125E-06***			***3.352E-07***	***1.790E-06***
Bis(2-ethylhexyl)phthalate (BEHP)	***5.708E-06***	***5.732E-03***			***5.732E-03***			***9.039E-04***	***4.828E-03***
Benzo(a)pyrene (BaP)	***4.741E-08***	***4.761E-05***			***4.181E+00***			***6.359E-06***	***4.181E+00***
Phenol	***3.210E-04***	***3.223E-01***			***3.223E-01***			***5.083E-02***	***2.715E-01***
Calcium Chloride Oxide									
Calcium Oxalate	4.720E-02	4.740E+01							
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)					9.399E+01			1.554E+01	8.302E+01
Calcium Citrate									
Calcium Fluoride									9.453E+01
Calcium Hydroxide					1.337E+03				1.246E+03
Pentachlorophenol	***6.948E-06***	***6.977E-03***			***6.977E-03***			***1.100E-03***	***5.877E-03***
Hexachlorobenzene	***1.132E-07***	***1.137E-04***			***4.186E+00***			***1.518E-05***	***4.186E+00***
Chlorobenzene	***4.539E-09***	***4.558E-06***			***4.558E-06***			***7.189E-07***	***3.840E-06***
2-Chloronaphthalene	***1.220E-08***	***1.225E-05***			***1.225E-05***			***1.932E-06***	***1.032E-05***
Carbon Dioxide	6.010E+00	6.035E+03			6.035E+03			9.518E+02	5.083E+03
Cesium Acetate	1.510E-02	1.517E+01							
Cesium Glycolate					1.643E+01			2.591E+00	1.384E+01
Dibenz[a,h]anthracene	***3.111E-06***	***3.124E-03***			***3.124E-03***			***4.927E-04***	***2.632E-03***
1,2-dibromoethane	***1.091E-07***	***1.096E-04***			***1.096E-04***			***1.728E-05***	***9.228E-05***
Diethyl phthalate	***1.967E-05***	***1.975E-02***			***1.975E-02***			***3.115E-03***	***1.664E-02***
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA	4.532E-02	4.552E+01			4.552E+01			7.178E+00	3.834E+01
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	8.672E-02	8.708E+01			8.708E+01			1.373E+01	7.335E+01
Water	7.618E+01	7.651E+04	7.780E+02	1.652E+04	9.260E+04	9.968E+02	1.438E+04	1.684E+04	8.996E+04
Sulfuric Acid									
Hydrogen Chloride	7.873E-01	7.906E+02			9.158E+02			1.447E+02	7.728E+02
Formic Acid	3.033E-02	3.046E+01			3.046E+01			4.804E+00	2.566E+01
Hydrofluoric Acid	1.035E-01	1.039E+02			1.376E+02			2.364E+01	1.263E+02
Mercury (II) Chloride									
Mercury (elemental)	1.043E-08	1.048E-05			1.048E-05			1.652E-06	8.826E-06
Mercury (II) Oxide	1.474E-03	1.481E+00			5.083E+01			1.492E+00	4.934E+01
Nitrous (III) Acid	7.053E+00	7.083E+03			1.095E+04			1.727E+03	9.225E+03
Nitric Acid	5.030E+00	5.052E+03			5.052E+03			7.967E+02	4.255E+03
Hexachlorobutadiene	***9.517E-11***	***9.557E-08***			***9.557E-08***			***1.507E-08***	***8.050E-08***
Potassium Citrate	2.162E-01	2.171E+02			2.171E+02			3.424E+01	1.829E+02
Potassium Acetate									
Potassium Chloride	2.861E+00	2.873E+03			2.612E+03			4.119E+02	2.200E+03

Stream	FCW5 Recycle	FCW5 Return	Leach-in	Total Leach	FCWash-Leach	Steam-in	Total Steam	UF2 Filtrate	UF2 Slurry
Potassium Glycolate					3.990E+02			6.292E+01	3.361E+02
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***2.658E-07***	***2.669E-04***			***2.669E-04***			***4.209E-05***	***2.248E-04***
4-methyl-2-pentanone (MIBK)	***5.062E-08***	***5.083E-05***			***5.083E-05***			***8.017E-06***	***4.282E-05***
Magnesium Oxalate	1.604E-07	1.610E-04							
Magnesium Dichromate (VI)					3.974E-06			8.621E-07	4.604E-06
Magnesium Hydroxide					2.392E+02				2.392E+02
Manganese (II) Oxalate	2.025E-04	2.034E-01			2.034E-01			3.208E-02	1.713E-01
Manganese (II) Hydroxide									
Nitrogen	1.043E-08	1.047E-05			1.047E-05			1.652E-06	8.822E-06
Sodium Oxalate	1.231E-01	1.236E+02			1.198E+04				1.196E+04
Sodium Chromate (VI)	6.394E-01	6.421E+02			5.232E+02			8.160E+01	4.358E+02
Sodium Fluoride Sulfate					2.294E+04				2.238E+04
Sodium Acetate	1.405E-02	1.411E+01							
Sodium Glycolate	3.489E-01	3.504E+02							
Sodium Nitrite	5.654E+00	5.678E+03							
Sodium Hydroxide	2.594E+01	2.605E+04	7.599E+02	1.614E+04	4.198E+04			6.666E+03	3.560E+04
Naphthalene	***1.342E-08***	***1.348E-05***			***1.348E-05***			***2.125E-06***	***1.135E-05***
Sodium Aluminosilicate Gel					1.122E+03				1.665E+03
Nickel (II) Oxalate	6.108E-04	6.133E-01			6.133E-01			9.673E-02	5.166E-01
Nickel (II) Hydroxide									
Oxygen	5.803E-09	5.827E-06			5.827E-06			9.190E-07	4.908E-06
Phosphorus Pentoxide	4.895E-02	4.915E+01			4.915E+01			7.752E+00	4.140E+01
PYRENE	***4.186E-07***	***4.204E-04***			***4.204E-04***			***6.630E-05***	***3.541E-04***
Silicon Dioxide	1.122E-02	1.127E+01			9.760E+02			1.229E+02	6.562E+02
Sulfur Trioxide	3.067E+00	3.080E+03			3.269E+02			8.990E+01	4.802E+02
1,2,4-trichlorobenzene	***2.833E-09***	***2.845E-06***			***2.845E-06***			***4.487E-07***	***2.397E-06***
1,2,3-trichloropropane	***1.997E-08***	***2.006E-05***			***2.006E-05***			***3.163E-06***	***1.689E-05***
TOLUENE	***1.759E-09***	***1.767E-06***			***1.767E-06***			***2.786E-07***	***1.488E-06***
Zinc Dichloride Pentoxide					1.691E+01			6.270E-01	3.349E+00
Zinc Oxalate	8.725E-02	8.761E+01			5.896E+01			1.275E+01	6.812E+01
Zinc Hydroxide									
Zirconium EDTA	2.342E-03	2.352E+00			2.352E+00			3.709E-01	1.981E+00
Zirconium Oxide									
Total g/hr	1.349E+02	1.354E+05	1.538E+03	3.266E+04	2.020E+05	9.968E+02	1.438E+04	2.818E+04	1.882E+05
Volume, L/hr	1.000E-01	1.004E+02	1.001E+00	2.126E+01	1.215E+02	1.000E+00	1.443E+01	2.111E+01	1.147E+02
Enthalpy, cal/hr	-4.126E+05	-4.144E+08	-4.956E+06	-1.053E+08	-6.111E+08	-3.780E+06	-5.453E+07	-8.975E+07	-5.760E+08
Vapor fraction									
Solid fraction					3.398E-02				3.562E-02
Organic fraction									
Osmotic Pres, atm	2.704E+02	2.704E+02	4.623E+03	4.623E+03	5.479E+02			4.780E+02	4.780E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.591E-01	2.591E-01			2.536E-01	5.489E-08	5.489E-08		
E-Con, cm2/ohm-mol	1.825E+01	1.825E+01			1.664E+01				
Abs Visc, cP	4.165E+00	4.165E+00	4.904E+01	4.904E+01	6.515E+00	8.907E-01	8.907E-01		
Rel Visc	4.676E+00	4.676E+00	5.506E+01	5.506E+01	7.314E+00	1.000E+00	1.000E+00		
Ionic Strength	9.914E+00	9.914E+00	2.442E+01	2.442E+01	1.142E+01	1.008E-07	1.008E-07	1.002E+01	1.002E+01

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	SCWash1 Slurry	SCW1 Liquor	SCW1 Solids	SCW1 Recycle	SCW1 Return	SCW2 Slurry	SCW2 Liquor	SCW2 Solids	SCW2 Recycle
Phase	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	15.1064	15.1064		15.1064	15.1064	15.1054	15.1054		15.1054
Total mol/hr	6593.64	6359.03	234.609	5.63599	6353.39	6593.55	6358.97	234.576	5.63605
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid	1.270E+01	1.270E+01		1.126E-02	1.269E+01	1.269E+01	1.269E+01		1.125E-02
Aluminum Oxide	7.725E+02	7.725E+02		6.846E-01	7.718E+02	7.711E+02	7.711E+02		6.834E-01
Aldrin	***3.646E-04***	***3.646E-04***		***3.232E-07***	***3.643E-04***	***3.643E-04***	***3.643E-04***		***3.229E-07***
Aluminum Hydrogen EDTA	7.599E+01	7.599E+01		6.735E-02	7.593E+01	7.593E+01	7.593E+01		6.730E-02
Aluminum Hydroxide									
Benzene	***1.790E-06***	***1.790E-06***		***1.587E-09***	***1.788E-06***	***1.788E-06***	***1.788E-06***		***1.585E-09***
Bis(2-ethylhexyl)phthalate (BEHP)	***4.828E-03***	***4.828E-03***		***4.279E-06***	***4.824E-03***	***4.824E-03***	***4.824E-03***		***4.275E-06***
Benzo(a)pyrene (BaP)	***4.181E+00***	***3.405E-05***	***4.181E+00***	***3.018E-08***	***3.402E-05***	***4.181E+00***	***3.410E-05***	***4.181E+00***	***3.023E-08***
Phenol	***2.715E-01***	***2.715E-01***		***2.406E-04***	***2.713E-01***	***2.713E-01***	***2.713E-01***		***2.404E-04***
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)	8.305E+01	8.305E+01		7.360E-02	8.297E+01	8.300E+01	8.300E+01		7.356E-02
Calcium Citrate									
Calcium Fluoride	9.615E+01		9.615E+01			9.777E+01		9.777E+01	
Calcium Hydroxide	1.244E+03		1.244E+03			1.243E+03		1.243E+03	
Pentachlorophenol	***5.877E-03***	***5.877E-03***		***5.208E-06***	***5.871E-03***	***5.871E-03***	***5.871E-03***		***5.204E-06***
Hexachlorobenzene	***4.186E+00***	***8.128E-05***	***4.186E+00***	***7.203E-08***	***8.120E-05***	***4.186E+00***	***8.141E-05***	***4.186E+00***	***7.216E-08***
Chlorobenzene	***3.840E-06***	***3.840E-06***		***3.403E-09***	***3.836E-06***	***3.836E-06***	***3.836E-06***		***3.400E-09***
2-Chloronaphthalene	***1.032E-05***	***1.032E-05***		***9.144E-09***	***1.031E-05***	***1.031E-05***	***1.031E-05***		***9.136E-09***
Carbon Dioxide	5.083E+03	5.083E+03		4.505E+00	5.079E+03	5.079E+03	5.079E+03		4.501E+00
Cesium Acetate									
Cesium Glycolate	1.384E+01	1.384E+01		1.227E-02	1.383E+01	1.383E+01	1.383E+01		1.226E-02
Dibenz[a,h]anthracene	***2.632E-03***	***2.632E-03***		***2.332E-06***	***2.629E-03***	***2.629E-03***	***2.629E-03***		***2.330E-06***
1,2-dibromoethane	***9.228E-05***	***9.228E-05***		***8.179E-08***	***9.220E-05***	***9.220E-05***	***9.220E-05***		***8.172E-08***
Diethyl phthalate	***1.664E-02***	***1.664E-02***		***1.474E-05***	***1.662E-02***	***1.662E-02***	***1.662E-02***		***1.473E-05***
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA	3.834E+01	3.834E+01		3.398E-02	3.830E+01	3.830E+01	3.830E+01		3.395E-02
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	7.335E+01	7.335E+01		6.501E-02	7.329E+01	7.329E+01	7.329E+01		6.495E-02
Water	9.006E+04	9.006E+04		7.982E+01	8.998E+04	9.008E+04	9.008E+04		7.984E+01
Sulfuric Acid									
Hydrogen Chloride	7.728E+02	7.728E+02		6.850E-01	7.721E+02	7.721E+02	7.721E+02		6.844E-01
Formic Acid	2.566E+01	2.566E+01		2.274E-02	2.563E+01	2.563E+01	2.563E+01		2.272E-02
Hydrofluoric Acid	1.261E+02	1.261E+02		1.118E-01	1.260E+02	1.259E+02	1.259E+02		1.116E-01
Mercury (II) Chloride									
Mercury (elemental)	8.826E-06	8.826E-06		7.822E-09	8.818E-06	8.818E-06	8.818E-06		7.815E-09
Mercury (II) Oxide	4.934E+01	7.963E+00	4.138E+01	7.058E-03	7.956E+00	4.933E+01	7.951E+00	4.138E+01	7.047E-03
Nitrous (III) Acid	9.225E+03	9.225E+03		8.176E+00	9.217E+03	9.217E+03	9.217E+03		8.169E+00
Nitric Acid	4.255E+03	4.255E+03		3.771E+00	4.251E+03	4.251E+03	4.251E+03		3.768E+00
Hexachlorobutadiene	***8.050E-08***	***8.050E-08***		***7.135E-11***	***8.043E-08***	***8.043E-08***	***8.043E-08***		***7.128E-11***
Potassium Citrate	1.829E+02	1.829E+02		1.621E-01	1.827E+02	1.827E+02	1.827E+02		1.619E-01
Potassium Acetate									
Potassium Chloride	2.200E+03	2.200E+03		1.950E+00	2.198E+03	2.198E+03	2.198E+03		1.948E+00

Stream	SCWash1 Slurry	SCW1 Liquor	SCW1 Solids	SCW1 Recycle	SCW1 Return	SCW2 Slurry	SCW2 Liquor	SCW2 Solids	SCW2 Recycle
Potassium Glycolate	3.361E+02	3.361E+02		2.978E-01	3.358E+02	3.358E+02	3.358E+02		2.976E-01
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***2.248E-04***	***2.248E-04***		***1.992E-07***	***2.246E-04***	***2.246E-04***	***2.246E-04***		***1.991E-07***
4-methyl-2-pentanone (MIBK)	***4.282E-05***	***4.282E-05***		***3.795E-08***	***4.278E-05***	***4.278E-05***	***4.278E-05***		***3.792E-08***
Magnesium Oxalate									
Magnesium Dichromate (VI)	4.616E-06	4.616E-06		4.091E-09	4.612E-06	4.623E-06	4.623E-06		4.097E-09
Magnesium Hydroxide	2.392E+02		2.392E+02			2.392E+02		2.392E+02	
Manganese (II) Oxalate	1.713E-01	1.713E-01		1.518E-04	1.712E-01	1.712E-01	1.712E-01		1.517E-04
Manganese (II) Hydroxide									
Nitrogen	8.822E-06	8.822E-06		7.819E-09	8.814E-06	8.814E-06	8.814E-06		7.812E-09
Sodium Oxalate	1.196E+04		1.196E+04			1.196E+04		1.196E+04	
Sodium Chromate (VI)	4.358E+02	4.358E+02		3.862E-01	4.354E+02	4.354E+02	4.354E+02		3.859E-01
Sodium Fluoride Sulfate	2.237E+04		2.237E+04			2.237E+04		2.237E+04	
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide	3.560E+04	3.560E+04		3.156E+01	3.557E+04	3.558E+04	3.558E+04		3.153E+01
Naphthalene	***1.135E-05***	***1.135E-05***		***1.006E-08***	***1.134E-05***	***1.134E-05***	***1.134E-05***		***1.005E-08***
Sodium Aluminosilicate Gel	1.668E+03		1.668E+03			1.671E+03		1.671E+03	
Nickel (II) Oxalate	5.166E-01	5.166E-01		4.579E-04	5.162E-01	5.162E-01	5.162E-01		4.575E-04
Nickel (II) Hydroxide									
Oxygen	4.908E-06	4.908E-06		4.350E-09	4.904E-06	4.904E-06	4.904E-06		4.346E-09
Phosphorus Pentoxide	4.140E+01	4.140E+01		3.669E-02	4.137E+01	4.137E+01	4.137E+01		3.666E-02
PYRENE	***3.541E-04***	***3.541E-04***		***3.138E-07***	***3.538E-04***	***3.538E-04***	***3.538E-04***		***3.136E-07***
Silicon Dioxide	6.552E+02	6.552E+02		5.807E-01	6.546E+02	6.537E+02	6.537E+02		5.794E-01
Sulfur Trioxide	4.829E+02	4.829E+02		4.280E-01	4.825E+02	4.852E+02	4.852E+02		4.301E-01
1,2,4-trichlorobenzene	***2.397E-06***	***2.397E-06***		***2.124E-09***	***2.394E-06***	***2.394E-06***	***2.394E-06***		***2.122E-09***
1,2,3-trichloropropane	***1.689E-05***	***1.689E-05***		***1.497E-08***	***1.688E-05***	***1.688E-05***	***1.688E-05***		***1.496E-08***
TOLUENE	***1.488E-06***	***1.488E-06***		***1.319E-09***	***1.487E-06***	***1.487E-06***	***1.487E-06***		***1.318E-09***
Zinc Dichloride Pentoxide	3.257E+00	3.257E+00		2.886E-03	3.254E+00	3.161E+00	3.161E+00		2.802E-03
Zinc Oxalate	6.828E+01	6.828E+01		6.052E-02	6.822E+01	6.838E+01	6.838E+01		6.060E-02
Zinc Hydroxide									
Zirconium EDTA	1.981E+00	1.981E+00		1.756E-03	1.979E+00	1.979E+00	1.979E+00		1.754E-03
Zirconium Oxide									
Total g/hr	1.883E+05	1.506E+05	3.763E+04	1.335E+02	1.505E+05	1.882E+05	1.506E+05	3.763E+04	1.335E+02
Volume, L/hr	1.148E+02	1.128E+02	1.961E+00	1.000E-01	1.127E+02	1.148E+02	1.128E+02	1.963E+00	1.000E-01
Enthalpy, cal/hr	-5.764E+08	-4.797E+08	-9.670E+07	-4.252E+05	-4.793E+08	-5.764E+08	-4.797E+08	-9.670E+07	-4.252E+05
Vapor fraction									
Solid fraction	3.558E-02		1.000E+00			3.558E-02		1.000E+00	
Organic fraction									
Osmotic Pres, atm	4.775E+02	4.775E+02		4.775E+02	4.775E+02	4.770E+02	4.770E+02		4.770E+02
Redox Pot, volts									
E-Con, 1/ohm-cm	2.573E-01	2.573E-01		2.573E-01	2.573E-01	2.573E-01	2.573E-01		2.573E-01
E-Con, cm2/ohm-mol	1.821E+01	1.821E+01		1.821E+01	1.821E+01	1.822E+01	1.822E+01		1.822E+01
Abs Visc, cP	5.517E+00	5.517E+00		5.517E+00	5.517E+00	5.510E+00	5.510E+00		5.510E+00
Rel Visc	6.193E+00	6.193E+00		6.193E+00	6.193E+00	6.186E+00	6.186E+00		6.186E+00
Ionic Strength	1.001E+01	1.001E+01		1.001E+01	1.001E+01	1.000E+01	1.000E+01		1.000E+01

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	SCW2 Return	SCW3 Slurry	SCW3 Liquor	SCW3 Solids	SCW3 Recycle	SCW3 Return	SCW4 Slurry	SCW4 Liquor	SCW4 Solids
Phase	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous	Mixed	Aqueous	Solid
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	15.1054	15.1044	15.1044		15.1044	15.1044	15.1033	15.1033	
Total mol/hr	6353.33	6593.45	6358.91	234.542	5.63612	6353.27	6593.36	6358.85	234.509
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid	1.268E+01	1.268E+01	1.268E+01		1.124E-02	1.267E+01	1.267E+01	1.267E+01	
Aluminum Oxide	7.704E+02	7.697E+02	7.697E+02		6.822E-01	7.690E+02	7.683E+02	7.683E+02	
Aldrin	***3.640E-04***	***3.640E-04***	***3.640E-04***		***3.226E-07***	***3.637E-04***	***3.637E-04***	***3.637E-04***	
Aluminum Hydrogen EDTA	7.586E+01	7.586E+01	7.586E+01		6.724E-02	7.579E+01	7.579E+01	7.579E+01	
Aluminum Hydroxide									
Benzene	***1.787E-06***	***1.787E-06***	***1.787E-06***		***1.584E-09***	***1.785E-06***	***1.785E-06***	***1.785E-06***	
Bis(2-ethylhexyl)phthalate (BEHP)	***4.819E-03***	***4.819E-03***	***4.819E-03***		***4.272E-06***	***4.815E-03***	***4.815E-03***	***4.815E-03***	
Benzo(a)pyrene (BaP)	***3.407E-05***	***4.181E+00***	***3.416E-05***	***4.181E+00***	***3.028E-08***	***3.413E-05***	***4.181E+00***	***3.422E-05***	***4.181E+00***
Phenol	***2.710E-01***	***2.710E-01***	***2.710E-01***		***2.402E-04***	***2.708E-01***	***2.708E-01***	***2.708E-01***	
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)	8.292E+01	8.295E+01	8.295E+01		7.352E-02	8.287E+01	8.290E+01	8.290E+01	
Calcium Citrate									
Calcium Fluoride		9.939E+01		9.939E+01			1.010E+02		1.010E+02
Calcium Hydroxide		1.241E+03		1.241E+03			1.239E+03		1.239E+03
Pentachlorophenol	***5.866E-03***	***5.866E-03***	***5.866E-03***		***5.199E-06***	***5.861E-03***	***5.861E-03***	***5.861E-03***	
Hexachlorobenzene	***8.134E-05***	***4.186E+00***	***8.155E-05***	***4.186E+00***	***7.228E-08***	***8.147E-05***	***4.186E+00***	***8.168E-05***	***4.186E+00***
Chlorobenzene	***3.833E-06***	***3.833E-06***	***3.833E-06***		***3.397E-09***	***3.829E-06***	***3.829E-06***	***3.829E-06***	
2-Chloronaphthalene	***1.030E-05***	***1.030E-05***	***1.030E-05***		***9.128E-09***	***1.029E-05***	***1.029E-05***	***1.029E-05***	
Carbon Dioxide	5.074E+03	5.074E+03	5.074E+03		4.498E+00	5.070E+03	5.070E+03	5.070E+03	
Cesium Acetate									
Cesium Glycolate	1.382E+01	1.382E+01	1.382E+01		1.225E-02	1.380E+01	1.380E+01	1.380E+01	
Dibenz[a,h]anthracene	***2.627E-03***	***2.627E-03***	***2.627E-03***		***2.328E-06***	***2.625E-03***	***2.625E-03***	***2.625E-03***	
1,2-dibromoethane	***9.212E-05***	***9.212E-05***	***9.212E-05***		***8.165E-08***	***9.204E-05***	***9.204E-05***	***9.204E-05***	
Diethyl phthalate	***1.661E-02***	***1.661E-02***	***1.661E-02***		***1.472E-05***	***1.659E-02***	***1.659E-02***	***1.659E-02***	
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA	3.827E+01	3.827E+01	3.827E+01		3.392E-02	3.824E+01	3.824E+01	3.824E+01	
Iron (III) Hydroxide									
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	7.322E+01	7.322E+01	7.322E+01		6.490E-02	7.316E+01	7.316E+01	7.316E+01	
Water	9.000E+04	9.010E+04	9.010E+04		7.986E+01	9.002E+04	9.012E+04	9.011E+04	
Sulfuric Acid									
Hydrogen Chloride	7.715E+02	7.715E+02	7.715E+02		6.838E-01	7.708E+02	7.708E+02	7.708E+02	
Formic Acid	2.561E+01	2.561E+01	2.561E+01		2.270E-02	2.559E+01	2.559E+01	2.559E+01	
Hydrofluoric Acid	1.258E+02	1.256E+02	1.256E+02		1.113E-01	1.255E+02	1.254E+02	1.254E+02	
Mercury (II) Chloride									
Mercury (elemental)	8.810E-06	8.810E-06	8.810E-06		7.809E-09	8.802E-06	8.802E-06	8.802E-06	
Mercury (II) Oxide	7.944E+00	4.933E+01	7.939E+00	4.139E+01	7.037E-03	7.932E+00	4.932E+01	7.927E+00	4.139E+01
Nitrous (III) Acid	9.209E+03	9.209E+03	9.209E+03		8.162E+00	9.200E+03	9.200E+03	9.200E+03	
Nitric Acid	4.247E+03	4.247E+03	4.247E+03		3.765E+00	4.244E+03	4.244E+03	4.244E+03	
Hexachlorobutadiene	***8.036E-08***	***8.036E-08***	***8.036E-08***		***7.122E-11***	***8.028E-08***	***8.028E-08***	***8.028E-08***	
Potassium Citrate	1.826E+02	1.826E+02	1.826E+02		1.618E-01	1.824E+02	1.824E+02	1.824E+02	
Potassium Acetate									
Potassium Chloride	2.196E+03	2.196E+03	2.196E+03		1.947E+00	2.194E+03	2.194E+03	2.194E+03	

Stream	SCW2 Return	SCW3 Slurry	SCW3 Liquor	SCW3 Solids	SCW3 Recycle	SCW3 Return	SCW4 Slurry	SCW4 Liquor	SCW4 Solids
Potassium Glycolate	3.355E+02	3.355E+02	3.355E+02		2.973E-01	3.352E+02	3.352E+02	3.352E+02	
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***2.244E-04***	***2.244E-04***	***2.244E-04***		***1.989E-07***	***2.242E-04***	***2.242E-04***	***2.242E-04***	
4-methyl-2-pentanone (MIBK)	***4.274E-05***	***4.274E-05***	***4.274E-05***		***3.788E-08***	***4.270E-05***	***4.270E-05***	***4.270E-05***	
Magnesium Oxalate									
Magnesium Dichromate (VI)	4.619E-06	4.630E-06	4.630E-06		4.104E-09	4.626E-06	4.638E-06	4.638E-06	
Magnesium Hydroxide		2.392E+02		2.392E+02			2.392E+02		2.392E+02
Manganese (II) Oxalate	1.710E-01	1.710E-01	1.710E-01		1.516E-04	1.709E-01	1.709E-01	1.709E-01	
Manganese (II) Hydroxide									
Nitrogen	8.806E-06	8.806E-06	8.806E-06		7.805E-09	8.798E-06	8.798E-06	8.798E-06	
Sodium Oxalate		1.196E+04		1.196E+04			1.196E+04		1.196E+04
Sodium Chromate (VI)	4.350E+02	4.349E+02	4.349E+02		3.855E-01	4.346E+02	4.345E+02	4.345E+02	
Sodium Fluoride Sulfate		2.236E+04		2.236E+04			2.235E+04		2.235E+04
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide	3.555E+04	3.555E+04	3.555E+04		3.151E+01	3.552E+04	3.552E+04	3.552E+04	
Naphthalene	***1.133E-05***	***1.133E-05***	***1.133E-05***		***1.004E-08***	***1.132E-05***	***1.132E-05***	***1.132E-05***	
Sodium Aluminosilicate Gel		1.673E+03		1.673E+03			1.676E+03		1.676E+03
Nickel (II) Oxalate	5.157E-01	5.157E-01	5.157E-01		4.571E-04	5.152E-01	5.152E-01	5.152E-01	
Nickel (II) Hydroxide									
Oxygen	4.900E-06	4.900E-06	4.900E-06		4.343E-09	4.895E-06	4.895E-06	4.895E-06	
Phosphorus Pentoxide	4.133E+01	4.133E+01	4.133E+01		3.663E-02	4.129E+01	4.129E+01	4.129E+01	
PYRENE	***3.535E-04***	***3.535E-04***	***3.535E-04***		***3.133E-07***	***3.532E-04***	***3.531E-04***	***3.531E-04***	
Silicon Dioxide	6.531E+02	6.521E+02	6.521E+02		5.780E-01	6.515E+02	6.506E+02	6.506E+02	
Sulfur Trioxide	4.848E+02	4.876E+02	4.876E+02		4.322E-01	4.871E+02	4.899E+02	4.899E+02	
1,2,4-trichlorobenzene	***2.392E-06***	***2.392E-06***	***2.392E-06***		***2.120E-09***	***2.390E-06***	***2.390E-06***	***2.390E-06***	
1,2,3-trichloropropane	***1.686E-05***	***1.686E-05***	***1.686E-05***		***1.495E-08***	***1.685E-05***	***1.685E-05***	***1.685E-05***	
TOLUENE	***1.486E-06***	***1.486E-06***	***1.485E-06***		***1.317E-09***	***1.484E-06***	***1.484E-06***	***1.484E-06***	
Zinc Dichloride Pentoxide	3.159E+00	3.066E+00	3.066E+00		2.718E-03	3.063E+00	2.971E+00	2.971E+00	
Zinc Oxalate	6.832E+01	6.847E+01	6.847E+01		6.069E-02	6.841E+01	6.857E+01	6.857E+01	
Zinc Hydroxide									
Zirconium EDTA	1.978E+00	1.978E+00	1.978E+00		1.753E-03	1.976E+00	1.976E+00	1.976E+00	
Zirconium Oxide									
Total g/hr	1.505E+05	1.882E+05	1.506E+05	3.762E+04	1.335E+02	1.504E+05	1.882E+05	1.505E+05	3.762E+04
Volume, L/hr	1.127E+02	1.148E+02	1.128E+02	1.964E+00	1.000E-01	1.127E+02	1.148E+02	1.128E+02	1.966E+00
Enthalpy, cal/hr	-4.793E+08	-5.763E+08	-4.796E+08	-9.669E+07	-4.251E+05	-4.792E+08	-5.763E+08	-4.796E+08	-9.668E+07
Vapor fraction									
Solid fraction		3.557E-02		1.000E+00			3.557E-02		1.000E+00
Organic fraction									
Osmotic Pres, atm	4.770E+02	4.766E+02	4.766E+02		4.766E+02	4.766E+02	4.761E+02	4.761E+02	
Redox Pot, volts									
E-Con, 1/ohm-cm	2.573E-01	2.573E-01	2.573E-01		2.573E-01	2.573E-01	2.573E-01	2.573E-01	
E-Con, cm2/ohm-mol	1.822E+01	1.823E+01	1.823E+01		1.823E+01	1.823E+01	1.825E+01	1.825E+01	
Abs Visc, cP	5.510E+00	5.503E+00	5.503E+00		5.503E+00	5.503E+00	5.496E+00	5.496E+00	
Rel Visc	6.186E+00	6.178E+00	6.178E+00		6.178E+00	6.178E+00	6.171E+00	6.171E+00	
Ionic Strength	1.000E+01	9.992E+00	9.992E+00		9.992E+00	9.992E+00	9.982E+00	9.982E+00	

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	SCW4 Recycle	SCW4 Return	SCWash5 Slurry	SCW5 Liquor	SCW5 Solids	SCW5 Recycle	SCW5 Return	Acid Rinse	Total Acid
Phase	Aqueous	Aqueous	Mixed	Aqueous	Solid	Aqueous	Aqueous	Aqueous	Aqueous
Temperature, C	25	25	25	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1	1	1	1
pH	15.1033	15.1033	15.1023	15.1023		15.1023	15.1023	-0.301785	-0.301785
Total mol/hr	5.63617	6353.22	6593.27	6358.79	234.475	5.63623	6353.16	53.9076	1633.01
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer									
Acetic Acid	1.123E-02	1.265E+01	1.265E+01	1.265E+01		1.122E-02	1.264E+01		
Aluminum Oxide	6.810E-01	7.677E+02	7.670E+02	7.670E+02		6.798E-01	7.663E+02	1.214E+00	3.678E+01
Aldrin	***3.223E-07***	***3.633E-04***	***3.633E-04***	***3.633E-04***		***3.221E-07***	***3.630E-04***		
Aluminum Hydrogen EDTA	6.718E-02	7.573E+01	7.573E+01	7.573E+01		6.712E-02	7.566E+01		
Aluminum Hydroxide									
Benzene	***1.582E-09***	***1.784E-06***	***1.784E-06***	***1.784E-06***		***1.581E-09***	***1.782E-06***		
Bis(2-ethylhexyl)phthalate (BEHP)	***4.268E-06***	***4.811E-03***	***4.811E-03***	***4.811E-03***		***4.264E-06***	***4.807E-03***		
Benzo(a)pyrene (BaP)	***3.033E-08***	***3.419E-05***	***4.181E+00***	***3.428E-05***	***4.181E+00***	***3.038E-08***	***3.424E-05***		
Phenol	***2.400E-04***	***2.705E-01***	***2.705E-01***	***2.705E-01***		***2.398E-04***	***2.703E-01***		
Calcium Chloride Oxide									
Calcium Oxalate									
Calcium Oxalate Monohydrate									
Calcium Carbonate									
Calcium Dichromate (VI)	7.348E-02	8.282E+01	8.285E+01	8.285E+01		7.343E-02	8.277E+01		
Calcium Citrate									
Calcium Fluoride			1.026E+02		1.026E+02				
Calcium Hydroxide			1.238E+03		1.238E+03				
Pentachlorophenol	***5.195E-06***	***5.856E-03***	***5.856E-03***	***5.856E-03***		***5.190E-06***	***5.851E-03***		
Hexachlorobenzene	***7.240E-08***	***8.161E-05***	***4.186E+00***	***8.182E-05***	***4.186E+00***	***7.252E-08***	***8.175E-05***		
Chlorobenzene	***3.394E-09***	***3.826E-06***	***3.826E-06***	***3.826E-06***		***3.391E-09***	***3.823E-06***		
2-Chloronaphthalene	***9.120E-09***	***1.028E-05***	***1.028E-05***	***1.028E-05***		***9.112E-09***	***1.027E-05***		
Carbon Dioxide	4.494E+00	5.065E+03	5.065E+03	5.065E+03		4.490E+00	5.061E+03		
Cesium Acetate									
Cesium Glycolate	1.224E-02	1.379E+01	1.379E+01	1.379E+01		1.222E-02	1.378E+01		
Dibenz[a,h]anthracene	***2.326E-06***	***2.622E-03***	***2.622E-03***	***2.622E-03***		***2.324E-06***	***2.620E-03***		
1,2-dibromoethane	***8.158E-08***	***9.196E-05***	***9.196E-05***	***9.196E-05***		***8.151E-08***	***9.187E-05***		
Diethyl phthalate	***1.471E-05***	***1.658E-02***	***1.658E-02***	***1.658E-02***		***1.469E-05***	***1.656E-02***		
Iron (III) Oxalate									
Iron (III) Hydrogen EDTA	3.389E-02	3.820E+01	3.820E+01	3.820E+01		3.386E-02	3.817E+01		
Iron (III) Hydroxide								9.175E-01	2.779E+01
Formic Acid, dimer									
Hydrofluoride, dimer									
2,2'-Iminobisacetic acid	6.484E-02	7.309E+01	7.309E+01	7.309E+01		6.479E-02	7.303E+01		
Water	7.987E+01	9.004E+04	9.013E+04	9.013E+04		7.989E+01	9.005E+04	9.343E+02	2.830E+04
Sulfuric Acid									
Hydrogen Chloride	6.832E-01	7.701E+02	7.701E+02	7.701E+02		6.826E-01	7.695E+02		
Formic Acid	2.268E-02	2.556E+01	2.556E+01	2.556E+01		2.266E-02	2.554E+01		
Hydrofluoric Acid	1.111E-01	1.253E+02	1.251E+02	1.251E+02		1.109E-01	1.250E+02		
Mercury (II) Chloride									
Mercury (elemental)	7.802E-09	8.794E-06	8.794E-06	8.794E-06		7.795E-09	8.787E-06		
Mercury (II) Oxide	7.026E-03	7.920E+00	4.931E+01	7.915E+00	4.140E+01	7.016E-03	7.908E+00		
Nitrous (III) Acid	8.155E+00	9.192E+03	9.192E+03	9.192E+03		8.148E+00	9.184E+03		
Nitric Acid	3.761E+00	4.240E+03	4.240E+03	4.240E+03		3.758E+00	4.236E+03	1.266E+02	3.834E+03
Hexachlorobutadiene	***7.116E-11***	***8.021E-08***	***8.021E-08***	***8.021E-08***		***7.110E-11***	***8.014E-08***		
Potassium Citrate	1.617E-01	1.822E+02	1.822E+02	1.822E+02		1.615E-01	1.821E+02		
Potassium Acetate									
Potassium Chloride	1.945E+00	2.192E+03	2.192E+03	2.192E+03		1.943E+00	2.190E+03		

Stream	SCW4 Recycle	SCW4 Return	SCWash5 Slurry	SCW5 Liquor	SCW5 Solids	SCW5 Recycle	SCW5 Return	Acid Rinse	Total Acid
Potassium Glycolate	2.971E-01	3.349E+02	3.349E+02	3.349E+02		2.968E-01	3.346E+02		
Potassium Nitrate (VI)									
gamma-BHC (Lindane)	***1.987E-07***	***2.240E-04***	***2.240E-04***	***2.240E-04***		***1.985E-07***	***2.238E-04***		
4-methyl-2-pentanone (MIBK)	***3.785E-08***	***4.267E-05***	***4.267E-05***	***4.267E-05***		***3.782E-08***	***4.263E-05***		
Magnesium Oxalate									
Magnesium Dichromate (VI)	4.111E-09	4.633E-06	4.645E-06	4.645E-06		4.117E-09	4.641E-06		
Magnesium Hydroxide			2.392E+02		2.392E+02			4.297E-02	1.302E+00
Manganese (II) Oxalate	1.515E-04	1.707E-01	1.707E-01	1.707E-01		1.513E-04	1.706E-01		
Manganese (II) Hydroxide								5.433E-02	1.646E+00
Nitrogen	7.798E-09	8.791E-06	8.791E-06	8.791E-06		7.792E-09	8.783E-06		
Sodium Oxalate			1.196E+04		1.196E+04				
Sodium Chromate (VI)	3.851E-01	4.341E+02	4.341E+02	4.341E+02		3.848E-01	4.337E+02		
Sodium Fluoride Sulfate			2.235E+04		2.235E+04				
Sodium Acetate									
Sodium Glycolate									
Sodium Nitrite									
Sodium Hydroxide	3.148E+01	3.549E+04	3.549E+04	3.549E+04		3.146E+01	3.546E+04	4.629E-01	1.402E+01
Naphthalene	***1.003E-08***	***1.131E-05***	***1.131E-05***	***1.131E-05***		***1.003E-08***	***1.130E-05***		
Sodium Aluminosilicate Gel			1.678E+03		1.678E+03				
Nickel (II) Oxalate	4.567E-04	5.148E-01	5.148E-01	5.148E-01		4.563E-04	5.143E-01		
Nickel (II) Hydroxide								1.663E-01	5.039E+00
Oxygen	4.339E-09	4.891E-06	4.891E-06	4.891E-06		4.335E-09	4.887E-06		
Phosphorus Pentoxide	3.660E-02	4.126E+01	4.126E+01	4.126E+01		3.657E-02	4.122E+01		
PYRENE	***3.130E-07***	***3.528E-04***	***3.528E-04***	***3.528E-04***		***3.127E-07***	***3.525E-04***		
Silicon Dioxide	5.767E-01	6.500E+02	6.491E+02	6.491E+02		5.753E-01	6.485E+02	1.093E-01	3.311E+00
Sulfur Trioxide	4.342E-01	4.895E+02	4.923E+02	4.923E+02		4.363E-01	4.918E+02		
1,2,4-trichlorobenzene	***2.119E-09***	***2.388E-06***	***2.388E-06***	***2.388E-06***		***2.117E-09***	***2.386E-06***		
1,2,3-trichloropropane	***1.493E-08***	***1.683E-05***	***1.683E-05***	***1.683E-05***		***1.492E-08***	***1.682E-05***		
TOLUENE	***1.316E-09***	***1.483E-06***	***1.483E-06***	***1.483E-06***		***1.314E-09***	***1.482E-06***		
Zinc Dichloride Pentoxide	2.633E-03	2.968E+00	2.876E+00	2.876E+00		2.549E-03	2.873E+00		
Zinc Oxalate	6.077E-02	6.851E+01	6.866E+01	6.866E+01		6.086E-02	6.860E+01		
Zinc Hydroxide									
Zirconium EDTA	1.751E-03	1.974E+00	1.974E+00	1.974E+00		1.750E-03	1.972E+00		
Zirconium Oxide								3.279E-01	9.932E+00
Total g/hr	1.334E+02	1.504E+05	1.881E+05	1.505E+05	3.761E+04	1.334E+02	1.504E+05	1.064E+03	3.224E+04
Volume, L/hr	1.000E-01	1.127E+02	1.148E+02	1.128E+02	1.968E+00	1.000E-01	1.127E+02	1.000E+00	3.029E+01
Enthalpy, cal/hr	-4.251E+05	-4.792E+08	-5.762E+08	-4.796E+08	-9.668E+07	-4.251E+05	-4.791E+08	-3.648E+06	-1.105E+08
Vapor fraction									
Solid fraction			3.556E-02		1.000E+00				
Organic fraction									
Osmotic Pres, atm	4.761E+02	4.761E+02	4.756E+02	4.756E+02		4.756E+02	4.756E+02	9.744E+01	9.744E+01
Redox Pot, volts									
E-Con, 1/ohm-cm	2.573E-01	2.573E-01	2.573E-01	2.573E-01		2.573E-01	2.573E-01	5.395E-01	5.395E-01
E-Con, cm2/ohm-mol	1.825E+01	1.825E+01	1.826E+01	1.826E+01		1.826E+01	1.826E+01	2.691E+02	2.691E+02
Abs Visc, cP	5.496E+00	5.496E+00	5.490E+00	5.490E+00		5.490E+00	5.490E+00	9.672E-01	9.672E-01
Rel Visc	6.171E+00	6.171E+00	6.163E+00	6.163E+00		6.163E+00	6.163E+00	1.086E+00	1.086E+00
Ionic Strength	9.982E+00	9.982E+00	9.973E+00	9.973E+00		9.973E+00	9.973E+00	2.114E+00	2.114E+00

Table B- 2. Waste Feed Evaporator 5 Stage Model Results for UF 1.35 Density Case (cont'd)[8]

Stream	Caustic Rinse	Total C Rinse	Acc1 Recycle	Total Recycle	HLW OG Cond	Evap Feed
Phase	Aqueous	Aqueous	Mixed	Mixed	Mixed	Mixed
Temperature, C	25	25	25	25	25	25
Pressure, atm	1	1	1	1	1	1
pH	12.8948	12.8948	14.6137	12.8607	11.2694	13.0705
Total mol/hr	55.498	5043.55	38.4571	7912.79	188132	197463
Flow Units	g/hr	g/hr	g/hr	g/hr	g/hr	g/hr
Acetic Acid, Dimer						
Acetic Acid						
Aluminum Oxide			2.910E+00	6.382E+01	1.231E+00	2.657E+03
Aldrin			***2.806E-06***	***7.204E-05***		***4.195E+00***
Aluminum Hydrogen EDTA			5.848E-01	1.727E+01		1.741E+03
Aluminum Hydroxide				4.776E+01		3.103E+03
Benzene			***1.377E-08***	***3.537E-07***		***4.194E+00***
Bis(2-ethylhexyl)phthalate (BEHP)			***3.715E-05***	***9.539E-04***		***4.193E+00***
Benzo(a)pyrene (BaP)			***2.967E-07***	***6.746E-06***		***4.181E+00***
Phenol			***2.089E-03***	***5.364E-02***		***4.196E+00***
Calcium Chloride Oxide					5.464E+02	
Calcium Oxalate			3.105E-01		5.512E+00	6.736E+02
Calcium Oxalate Monohydrate					2.059E+00	
Calcium Carbonate				5.280E+00		
Calcium Dichromate (VI)						
Calcium Citrate				1.867E+00		
Calcium Fluoride					5.358E+02	3.237E+02
Calcium Hydroxide						
Pentachlorophenol			***4.522E-05***	***1.161E-03***		***4.196E+00***
Hexachlorobenzene			***7.082E-07***	***1.610E-05***		***4.188E+00***
Chlorobenzene			***2.954E-08***	***7.586E-07***		***4.190E+00***
2-Chloronaphthalene			***7.938E-08***	***2.038E-06***		***4.194E+00***
Carbon Dioxide			3.911E+01	1.002E+03		7.847E+04
Cesium Acetate			9.831E-02	2.524E+00		1.972E+02
Cesium Glycolate						
Dibenz[a,h]anthracene			***2.025E-05***	***5.199E-04***		***4.191E+00***
1,2-dibromoethane			***7.101E-07***	***1.823E-05***		***2.806E+01***
Diethyl phthalate			***1.280E-04***	***3.287E-03***		***4.202E+00***
Iron (III) Oxalate					1.343E+00	
Iron (III) Hydrogen EDTA			2.950E-01	4.792E+00		
Iron (III) Hydroxide				2.866E+01	1.547E+02	
Formic Acid, dimer						
Hydrofluoride, dimer						
2,2'-Iminobisacetic acid			5.644E-01	1.449E+01		1.132E+03
Water	9.980E+02	9.070E+04	5.357E+02	1.371E+05	3.361E+06	3.290E+06
Sulfuric Acid						
Hydrogen Chloride			5.124E+00	1.301E+02	1.862E+04	
Formic Acid			1.974E-01	5.069E+00		3.961E+02
Hydrofluoric Acid			5.609E-01	2.471E+01	2.116E+01	3.388E+03
Mercury (II) Chloride						
Mercury (elemental)			6.791E-08	1.744E-06		
Mercury (II) Oxide			2.148E-02	1.534E+00		1.361E+02
Nitrous (III) Acid			6.437E+01	4.828E+02	3.708E+03	9.342E+04
Nitric Acid			3.274E+01	4.675E+03	1.888E+03	4.525E+04
Hexachlorobutadiene			***6.194E-10***	***1.590E-08***		***4.200E+00***
Potassium Citrate			1.407E+00	3.384E+01		2.823E+03
Potassium Acetate						2.195E+02
Potassium Chloride			1.862E+01	4.797E+02	1.845E+04	1.350E+03

Stream	Caustic Rinse	Total C Rinse	Acc1 Recycle	Total Recycle	HLW OG Cond	Evap Feed
Potassium Glycolate						
Potassium Nitrate (VI)						2.357E+04
gamma-BHC (Lindane)			***1.730E-06***	***4.442E-05***		***4.209E+00***
4-methyl-2-pentanone (MIBK)			***3.295E-07***	***8.460E-06***		***4.197E+00***
Magnesium Oxalate			1.056E-07	1.488E-03	2.060E+00	
Magnesium Dichromate (VI)						
Magnesium Hydroxide			3.581E-07	1.301E+00	2.368E+02	
Manganese (II) Oxalate			1.318E-03	2.485E-01		
Manganese (II) Hydroxide				1.512E+00		
Nitrogen			6.788E-08	1.743E-06		
Sodium Oxalate			5.275E-01			1.433E+04
Sodium Chromate (VI)			4.162E+00	1.069E+02		8.349E+03
Sodium Fluoride Sulfate			1.631E+00			
Sodium Acetate			9.147E-02	2.349E+00		
Sodium Glycolate			2.271E+00	5.832E+01		4.556E+03
Sodium Nitrite			9.697E+00	1.966E+03	3.054E+03	6.342E+04
Sodium Hydroxide	4.000E+00	3.635E+02	2.023E+02	6.114E+03	2.572E+04	3.253E+05
Naphthalene			***8.735E-08***	***2.243E-06***		***4.188E+00***
Sodium Aluminosilicate Gel			9.582E-01	3.466E+02	2.920E+03	
Nickel (II) Oxalate			3.975E-03	8.077E+00		
Nickel (II) Hydroxide						
Oxygen			3.777E-08	9.698E-07		
Phosphorus Pentoxide			3.186E-01	8.180E+00		6.391E+02
PYRENE			***2.725E-06***	***6.996E-05***		***4.202E+00***
Silicon Dioxide			8.693E-01	3.496E+00	3.339E+02	
Sulfur Trioxide			1.550E+01	1.074E+02	5.781E+02	4.702E+04
1,2,4-trichlorobenzene			***1.844E-08***	***4.735E-07***		***4.193E+00***
1,2,3-trichloropropane			***1.300E-07***	***3.338E-06***		***4.198E+00***
TOLUENE			***1.145E-08***	***2.940E-07***		***4.194E+00***
Zinc Dichloride Pentoxide				5.119E+00	9.198E+00	
Zinc Oxalate			5.678E-01	5.908E+00		
Zinc Hydroxide					7.281E+02	
Zirconium EDTA			1.524E-02	7.440E-01		
Zirconium Oxide				9.818E+00		
Total g/hr	1.002E+03	9.106E+04	9.416E+02	1.528E+05	3.438E+06	4.012E+06
Volume, L/hr	1.001E+00	9.095E+01	7.001E-01	1.436E+02	3.405E+03	3.551E+03
Enthalpy, cal/hr	-3.796E+06	-3.449E+08	-2.914E+06	-5.506E+08	-1.289E+10	-1.404E+10
Vapor fraction						
Solid fraction			2.980E-04	1.707E-04	1.181E-04	2.238E-04
Organic fraction						
Osmotic Pres, atm	4.622E+00	4.622E+00	3.275E+02	4.822E+01	1.256E+01	9.071E+01
Redox Pot, volts						
E-Con, 1/ohm-cm	2.233E-02	2.233E-02	2.600E-01	9.183E-02	2.639E-02	1.378E-01
E-Con, cm2/ohm-mol	2.235E+02	2.235E+02	2.138E+01	3.893E+01	9.004E+01	6.830E+01
Abs Visc, cP	9.101E-01	9.101E-01	4.450E+00	1.063E+00	9.062E-01	1.494E+00
Rel Visc	1.022E+00	1.022E+00	4.996E+00	1.194E+00	1.017E+00	1.678E+00
Ionic Strength	1.002E-01	1.002E-01	9.907E+00	1.376E+00	2.815E-01	3.062E+00