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Atlantic Richfield Hanford Company

Richland, Washington 99352

ARH-1757

PROCESS SPECIFICATIONS AND STANDARDS FOR THE 1970 THORIUM CAMPAIGN IN THE PUREX PLANT

June 30, 1970

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MASTER

PREPARED FOR THE U.S. ATOMIC ENERGY COMMISSION UNDER CONTRACT AT(45-1) 2130

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PROCESS SPECIFICATIONS AND STANDARDS

1.1 INTRODUCTION

The process specifications and standards for thorium processing operations in the Purex Plant are presented in this document. On the basis of the thorium processing flowsheet,[1] these specifications represent currently known limits within which plant processing conditions must be maintained to meet defined product requirements safely and with minimum effect on equipment service life. The process specifications cover the general areas of (1) feed, (2) essential materials, and (3) chemical hazards. The minimum technical requirements for the uranium-233 products are presented with the intent that these "best effort" or "target" values should be achieved. "Target values" are also presented for the thorium nitrate product. Criticality prevention specifications for the 1970 Thorium Campaign are presented in Reference 2.

The approvals required for these specifications and standards are designated by the individual approval sheets at the end of each section. For any revisions that may be required, it is intended that the designated level of approval also be required. A separate sheet will be provided for recording and approving such revisions for each section.

[1] ARH-1748, G.F. Smith, "Purex Plant Chemical Flowsheet for the 1970 Thorium Campaign," July 10, 1970.

[2] ARH-1514, June 1, 1970, W.E. Matheison, G.C. Oberg, and G.L. Ritter, "Criticality Prevention Specifications, Thorium-Uranium-233 Separations in the Purex Plant."

1.2 FEED SPECIFICATIONS

1.2.1 Charging

On the basis of reactor shipping records and visual observation of loaded buckets, no reactor product materials other than DUN reactor, aluminum-clad, irradiated thoria targets shall be accepted for processing at the Purex Plant during a scheduled thoria processing campaign.

1.2.2 Scheduling

Scheduling of the charging of the irradiated thoria target elements to the dissolvers, as based on reactor shipping records, shall satisfy the following requirements:

a. The concentration of I-131 per dissolver charge shall not average greater than 20 curies per ton of thorium.*

b. The concentration of Pa-233 per dissolver charge shall not be greater than 1 gram per ton of thorium.

c. The calculated maximum average U-238 fraction of total uranium in a dissolver charge shall be no more than:

   (1) 0.8 percent for the purge portion of the run.

   (2) 0.2 percent for the product portion of the run.

d. The calculated maximum average U-232-to-U-233 mass ratio in a dissolver charge shall be no more than:

   (1) 1×10^{-5} for the purge portion of the run.

   (2) 8×10^{-6} for the product portion of the run.

* The intent of this specification is to insure that the emission of I-131 from the Purex Plant can be practicably controlled at less than 0.2 curies per day.

1.2.3 APPROVALS FOR SECTION 1.2

Prepared by: R.E. Van der Cook — 7/14/70
Process Engineer - Separations Process Engineering — Date

Issued by: G.L. Ritter — 7-29-70
Manager - Separations Process Engineering — Date

Approved by: S.J. Beard — 7-30-70
Manager - Operations Support Engineering — Date

Accepted by: C.W. Malody — 7-31-70
Manager - Purex — Date

1.3 ESSENTIAL MATERIALS

1.3.1 Only those essential materials listed below shall be used for thorium processing. The specifications for these materials shall be as defined by the Essential Materials Manual.[1]

a. Sodium hydroxide (50% solution)

b. Nitric acid (57% solution)

c. Aluminum nitrate nonahydrate

d. Ferrous sulfamate

e. Phosphoric acid

f. Sugar (sucrose)

g. Normal paraffin hydrocarbon

h. Tributyl phosphate

i. Sodium nitrate

j. Sodium carbonate

k. Potassium permanganate

l. Potassium fluoride

m. Oxalic acid

n. Sodium nitrite

o. Sulfuric acid

p. Amberlite IRA-93 anion exchange resin

q. Dowex HCR-W cation exchange resin

r. Cadmium nitrate (50% solution)

s. Dowex 50W-X8[2]

t. Dow Corning Antifoam B Emulsion[2]

u. Tartaric acid

[1] ARH-91, February 15, 1968, "Chemical Processing Division Essential Materials Manual"

[2] Purchased as commercial product.

1.3.2 APPROVALS FOR SECTION 1.3

Prepared by:	R E Vanden Cook Process Engineer - Separations Process Egnineering	7/14/70 Date
Issued by:	G. L. Ritter Manager - Separations Process Engineering	7-29-70 Date
Approved by:	L J Beard Manager - Operations Support Engineering	7-30-70 Date
Accepted by:	C W Malody Manager - Purex	7-31-70 Date

1.4 PRODUCT QUALITY

The requirements for U-233 and thorium products are given in Section 2.4.

1.5 CHEMICAL HAZARDS CONTROL SPECIFICATIONS

The chemicals that are used for thorium processing and the chemical characteristics of the thorium processing streams introduce potential hazards of fire or other uncontrolled chemical reactions in the Purex Plant. The limits or restrictions necessary to maintain the probability of a hazardous incident at acceptably low levels are defined by the specifications below. They were developed in conjunction with the other specifications included in this document, and in conjunction with the chemical processes defined and recommended [1] for processing the specified feed material (Section 2.0).

1.5.1 General

1.5.1.1 Changes to the approved thorium processing systems that could affect the chemical hazards considerations shall be approved by the Manager, Separations Process Engineering, prior to their processing use.

1.5.1.2 Deviations from specifications shall be promptly called to the attention of the Manager, Separations Process Engineering. Plans for corrective action shall be developed promptly and shall be acted upon accordingly. The plans and procedures required for the corrective action shall be subject to approval for chemical safety considerations by the Manager, Separations Process Engineering.

1.5.1.3 The Manager, Separations Process Engineering shall revise or supplement these specifications as required to permit justified changes in the process or equipment. Supplements or revisions of these specifications require the same level of review, approval, and acceptance as the specifications themselves.

1.5.2 Radiolytic Heat Specifications

1.5.2.1 The quantity of radioactivity introduced to any process vessel shall be limited such that adequate cooling capacity is available for maintaining the vessel solution temperature at less than 50° C.

1.5.3 Hydrogen Formation Specifications

1.5.3.1 Radiolytic Formation of Hydrogen

Vessel atmospheres shall be controlled by air dilution such that the calculated concentration of hydrogen gas

[1] ARH-1748, July 10, 1970, G.F. Smith, "Purex Plant Chemical Flowsheet for the 1970 Thorium Campaign"

formed by solution radiolysis does not exceed two volume percent based on a hydrogen formation rate of 0.043 cubic feet per kilowatt-hour of radioisotopic energy.

1.5.3.2 Chemical Formation of Hydrogen

Sodium hydroxide shall not be added to a dissolver charge of aluminum-clad thorium slugs unless the slugs are covered with enough sodium nitrate solution of at least 0.2M concentration to give a mole ratio of sodium nitrate to aluminum (slug jacket) of at least 1.0.

1.5.4 Organic Vapors and Solvent Nitration Specifications

1.5.4.1 Definitions

a. For purposes of these specifications, organic shall be considered to be normal paraffin hydrocarbon (NPH) diluent in any combination with tributyl phosphate (TBP).

b. For purposes of these specifications, any process stream that "might contain an organic phase" shall include any stream that has been previously in contact with an organic phase. Likewise, any vessel to which "an organic phase might be introduced" shall include any vessel that receives a stream that might contain an organic phase.

1.5.4.2 Specifications

a. Vessel Temperature

Any process vessel, including any condenser, to which an organic phase might be introduced, shall not be operated above 65° C, except as permitted by the conditions described by (1) and (2), below.

(1) For vessels that are required to operate above 65° C, any influent liquid process stream that might contain an organic phase shall be pretreated for organic removal by decanting or by steam stripping. If steam stripping is used, the weight ratio of steam vapor to liquid shall be at least 0.5.

(2) Vessels containing solutions that have contacted an organic phase and have not been steam

stripped or decanted shall be operated above 65° C only under the conditions outlined in a special procedure approved by the Manager, Separations Process Engineering. The maximum solution temperature in any vessel containing solution which has contacted a solvent phase and has undergone subsequent steam stripping or decanting shall be 125° C, as measured by in-vessel thermohms.

b. Heat Transfer Surface Temperature

Tube Bundle Surface Temperature: The concentrators shall be operated at or below the following maximum tube bundle steam pressures (and corresponding tube bundle surface temperatures) as measured by steam line pressure gauges:

E-K4, E-J8, E-H4, E-N6	29 psig (135° C)
E-F6	39 psig (141° C)

1.5.5 Ammonia Hazards Control Specifications

To prevent the formation of flammable ammonia-air mixtures in the Purex Plant during the run, the following specifications are required.

1.5.5.1 Dissolver System

a. During the coating removal operation, the unheated dissolver off-gas shall be maintained at less than 14 volume percent of ammonia by controlling the sodium hydroxide addition rate.

b. During the coating removal operation, the ammonia scrubber water rate shall be a minimum of 7 gallons per minute.

c. The silver reactor influent gas shall be maintained between 350 and 400° F during coating removal and dissolution.

1.5.5.2 Waste Neutralization

During waste neutralization in TK-F15, TK-F16, and TK-F18, the atmosphere in the tank shall contain sufficient water vapor to prevent a flammable mixture of air and ammonia by controlling the tank temperature.

1.5.6 Dissolver Erosion Specifications

In order to prevent erosion of the dissolver bottoms beneath the lifter-circulators, the impinging air velocity shall be no greater than 55 feet per second by controlling the air to the spargers.

1.5.7 Fluoride Corrosion Control Specifications

Fluoride-induced corrosion of stainless steel equipment shall be minimized by maintaining a mole ratio of complexing (aluminum or thorium) ions to fluoride ions in excess of 3 to 1 in those process solutions where the fluoride ion concentration exceeds 0.001M.

1.5.8 Sugar Denitration Specifications

To prevent uncontrolled reactions between sugar and nitric acid in the waste treatment system the following specifications are required.

1.5.8.1 Sugar Routing

Solutions containing sugar shall not be added from AMU vessels to canyon vessels other than TK-F7, TK-F15 and TK-F16.

1.5.8.2 Temperature

Whenever sugar solution* is added to E-F6, TK-F15 or TK-F16, the temperature shall exceed 90° C.

1.5.8.3 Sugar Concentration

a. The maximum concentration of sugar in the 1WF Tank (TK-F7) shall be 0.005M. This can be accomplished by maintaining the flow ratio of 1WF to 1WF-Sugar greater than 140.

b. The maximum amount of sugar added to TK-F15 or TK-F16 shall be less than 0.073 moles of sugar per mole of nitric acid (0.40 pounds of sugar per pound of nitric acid).

1.5.8.4 Tank Pressurization

Addition of solution containing sugar to any canyon vessel that is pressurized with respect to the canyon cell in which the vessel is located shall be terminated and/or prohibited.

* Solution transfers resulting from normal processing of waste in E-F6 through TK-F26 to TK-F15 and TK-F16 are exempt from this requirement.

1.5.9 Waste Neutralization Specifications

All wastes routed to underground storage tanks shall be neutralized as follows:

a. Sugar denitrated solvent extraction wastes shall have a pH of 11 or greater.

b. All other equipment flushes and thorium processing wastes shall have a pH of 8 or greater.

1.5.10 APPROVALS FOR SECTION 1.5

Prepared by:	Process Engineer - Separations Process Engineering	7/14/70 Date
Issued by:	Manager - Separations Process Engineering	7-24-70 Date
Approved by:	Manager - Operations Support Engineering	7-24-70 Date
Accepted by:	Manager - Purex	7/28/70 Date

2.1 INTRODUCTION

The standards defined in the following sections were selected to define the actions required to implement the specifications in the preceeding sections. Any revisions require the same level of approval as the original standards.

2.2 FEED STANDARDS

2.2.1 Charging

Prior to charging each bucket, a visual inspection of the bucket contents shall be made to guard against inadvertent charging of fuel other than thoria targets.

2.2.2 Scheduling

The reactor shipping records may be compared with dissolver charge shcedules to satisfy the specifications. Other arrangements may also satisfy the specification requirements.

2.2.3 APPROVALS FOR SECTION 2.2

Prepared by: R E Van der Cook — 7/14/70
Process Engineer - Separations Process Engineering — Date

Issued by: G. L. Ritter — 8-3-70
Manager - Separations Process Engineering — Date

Accepted by: O. C. Bearlin — 8-3-70
Manager - Purex Operations — Date

2.3 ESSENTIAL MATERIAL STANDARDS

Specifications for essential materials are presented in Section 1.3.

2.4 PRODUCT QUALITY

2.4.1 Basis

The capability of the thorium processing flowsheet for consistently producing uranium-233 and thorium nitrate products of a specified quality has not been demonstrated. Hence, firm product specifications have not been defined. Instead, minimum technical requirements for the U-233 and purity goals for the thorium are proposed on the basis of (a) requirements of product customers, (b) process performance estimates by Separations Process Engineering, and (c) potential reuse of the thorium nitrate product. These requirements should also provide product of adequate purity for any on-site processing that might be subsequently planned.

2.4.2 General

a. Additions and revisions to these goals shall be made by mutual agreement of the Manager, Purex Operations, and the Manager, Separations Process Engineering.

b. Failure to meet any of these goals shall be investigated and the cause corrected, as possible, to the mutual satisfaction of the Manager, Purex, and the Manager, Separations Process Engineering.

2.4.3 Minimum Technical Requirements for Uranium-233

2.4.3.1 Basis

The sampling, analytical requirements and purity requirements presented in this section are required to provide a product suitable for use by the customer.

2.4.3.2 Sampling

A 100 ml plastic bottle sample shall be obtained of each 12 kg maximum product batch in TK-L9. The customer requires four samples, containing 4 to 6 gm of U-233, representative of the third, tenth, twentieth, and the thirtieth 12 kg increment of contained U-233 shipped to the user. These shall be forwarded to the customer within one month after manufacture.

2.4.3.3 Analytical Methods

The analytical methods presented below reflect the most satisfactory methods currently available. Any improved methods subsequently developed may be used with the concurrence of the Manager, Separations Chemistry Laboratory, but the Manager, Separations Process Engineering should be so advised.

2.4.3.4 Product Quality

	Component	Technical Requirement	Suggested Analytical Method
a.	Nitric Acid	Report measured value	HVC-21c
b.	Uranium Concentration	300-375 g/l	UC-21c
c.	Uranium isotopic concentration* (based on total U)		Mass Spec

Average for the Run

U-232	8 ppm max. - AEA
U-233	97 w/o min.
U-234	2.5 w/o max.
U-235	0.5 w/o max.
U-236	0.1 w/o max.
U-238	0.5 w/o max.

d. Impurities - The average impurity content of the total order quantity of purified material shall not exceed a total Neutron Poison Equivalence of 260.** In addition, no impurity shall exceed the indicated maximum individual impurity limits specified below, for any analysis:

* For uranium-235 and -236 isotopic analysis, the precision of reported values shall be equal to or smaller than ±0.01 weight percent (absolute). For uranium-234 and -238, this precision shall be equal to or smaller than ±0.02 weight percent (absolute).

** The total Neutron Poison Equivalence is determined by calculating the sum of the product of (ppm of impurity) times (neutron poison equivalence factor of the impurity). Limits of detection shall be used in calculating the neutron poison equivalence when results of analysis are below these limits.

Impurity	Neutron Poison Equivalence Factor	Maximum Individual Impurity Limit(ppmpUO$_2$)	Method*
Aluminum (Al)	0.01	300	
Boron (B)	30.0	3	
Calcium (Ca)	0.07	100	
Cadmium (Cd)	2.3	5	
Chlorine+Bromine (Cl+Br)	1.2	40	ClN-2a
Cobalt (Co)	1.0	25	
Chromium (Cr)	0.07	100	
Copper (Cu)	0.09	150	
Mercury (Hg)	-	50	HgS-a
Iron (Fe)	0.06	1,000	
Potassium (K)	0.06	200	
Magnesium (Mg)	0.03	150	
Manganese (Mn)	0.34	50	
Molybdenum (Mo)	0.11	100	
Sodium (Na)	0.02	300	
Nickel (Ni)	0.11	200	
Neptunium (Np)	2.4	100	NpA-6c
Phosphorus (P)	0.03	150	
Plutonium (Pu) (Total)	-	150	PuA-30a
(Pu)238	1.05	25	Ratio
Silicon (Si)	0.02	300	
Thorium (Th)	-	1,000	THS-1x
Titanium (Ti)	0.16	75	
Vanadium (V)	0.13	100	
Tungsten (W)	0.50	20	WS-a
Zinc (Zn)	0.02	100	

*By emission spectrograph except as noted.

e. Radioactivity

(1) Alpha Activity - Gross alpha activity at the time of separation shall be no more than 2.6×10^{10} d/m/gram of product.

(2) Gamma Activity - Activity of gamma-emitting isotopes, time corrected to the completion of purification of U-233, shall be less than:

Component	Target Limit
Th 228	0.84 μCi/gram of Uranium
Sum of Pa-233, Zr-Nb-95, Ru total and Th-228 daughters*	22 μCi/gram of Uranium

2.4.4 Thorium Product

2.4.4.1 Basis

The sampling and analytical requirements and purity goals presented in this section should provide a thorium (TNT) nitrate tetrahydrate product of adequate purity for recycling to the reactors.

2.4.4.2 Sampling

A bottle sample (150-200 ml) should be obtained from each batch of TNT product in TK-K6. An aliquot sufficient for the Purex analytical requirements is removed and the remainder held for compositing.

2.4.4.3 Analytical Methods

The suggested analytical methods presented below reflect the most satisfactory methods currently available. Any improved methods subsequently developed may be used, with the concurrence of the Manager, Separations Chemistry Laboratory; but the Manager, Separations Process Engineering should be so advised.

2.4.4.4 Product Quality

Component	Target Limit	Suggested Analytical Method
Thorium	3.5 ±0.5 lb/gal	Th XR-1a
HNO_3	0.5 ±0.3 lb/gal	HVC-2a
Radiochemical Impurities (thorium weight basis):		
Pu	< 10 ppb	PuA-20a
U-233	< 20 ppm	U-1X (AT Mount)

* Ra-224, Rn-220, Pb-212, Bi-212, Tl-208

Component	Target Limit	Suggested Analytical Method
Total U (Excluding U-233)	< 10 ppm	U-1X (UF Mount)
ZrNb-95	< 50 µCi/lb	GE-1a
Ru-103, RuRh-106	< 50 µCi/lb	GE-1a
Pa-233	< 300 µCi/lb	GE-1a

Chemical Impurities (Thorium weight basis):

Silicon	< 50 ppm	Emission Spec.
Iron	< 100 ppm	Emission Spec.
Total Impurities *	< 1000 ppm	Emission Spec.
Chloride	< 50 ppm	To be determd.
Sulfate	< 200 ppm	To be determd.

* Al, B, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, P, Pb, Si, Sn, Zn

2.4.5 APPROVALS FOR SECTION 2.4

Prepared by: ______________________ 7/30/70
Process Engineer - Separations Process Engineering — Date

Issued by: ______________________ 8-3-70
Manager - Separations Process Engineering — Date

Accepted by: ______________________ 8/3/70
Manager - Purex Analytical Laboratory — Date

Accepted by: ______________________ 8/3/70
Manager - Plutonium Finishing Laboratory — Date

Accepted by: ______________________ 8-3-70
Manager - Purex Operations — Date

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REVISION APPROVALS FOR SECTION 2.4

Prepared by: Process Engineer	Issued by: Manager - Sep. Proc. Eng.	Accepted by: Manager - Purex Anal. Lab	Accepted by: Manager - Pu Fin. Lab	Accepted by: Manager - Purex Oper.	Pages Revised
[signature]	FOR GL RITTER D G Harlow	[signature]	C P Sutter	[signature]	2.4-3
Date: 10/7/70	Date: 10/7/70	Date: 10/8/70	Date: 10-12-70	Date: 10-12-70	Dt: 10/7/70
Date:	Date:	Date:	Date:	Date:	Dt:
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2.5 CHEMICAL HAZARDS CONTROL STANDARDS

The limits defined by these standards are such that the corresponding Chemical Hazards Control Specifications will not be exceeded.

2.5.1 General

Additions or revisions to the standard require the same level of approval as the standards themselves.

2.5.2 Radiolytic Heat Standards

Heat generation in the thorium solutions for the 1970 campaign is minimal due to the long aging time. Total heat contained is less than 70,000 BTU per hour as of July 1, 1970. The cooling capabilities of all process tanks is shown in the table below.

	Vessel	Cooling Capabilities*
a.	Standard Purex Vessel (TK-D1, D2, D5, E3, E5, E6, F3, F4, F7, F5, F10, F12, F13, F15, F16, F18, G8, H1, J1, J3, K1, K5, K6)	> 500,000 BTU/hr
b.	Tanks E1, G2	> 150,000 BTU/hr
c.	Purex Annular Dissolver	> 1,000,000 BTU/hr

2.5.3 Hydrogen Formation Standards

a. Radiolytic Formation of Hydrogen

Based on the average expected heat content in the thoria, the maximum hydrogen evolution rate in a Purex tank is expected to be 0.01 cubic feet per hour. Addition of 1 cubic foot per hour of air shall be maintained to dilute this to a safe concentration.

b. Chemical Formation of Hydrogen

(1) For a standard charge the dissolver should contain at least 1,370 pounds of sodium nitrate (dry basis).

(2) During the addition of sodium hydroxide to a dissolver, the solution in the dissolver shall be agitated by boiling or air sparging.

* Assumes 40° solution temperature and a cooling water temperature of 20° C and a heat transfer coefficient of 50 BTU/hr-ft^2-° F.

2.5.4 Organic Vapor and Solvent Nitration Standards

2.5.4.1 The following streams shall be decanted in the corresponding tank:

Stream	Tank	Concentrator
1WF	F7	E-F6
3BU	N1	E-N6

2.5.4.2 The following streams shall be routed to the tower of the appropriate concentrator for steam stripping:

Stream	Concentrator
1BT	E-J8
1CU	E-H4
2ET	E-K4

2.5.4.3 Steam Stripping

Effective control of the steam stripping operation shall be maintained by (1) initially starting up the concentrators by establishing and maintaining the boiling of solvent-free solutions (such as water, fresh acid, or concentrator bottoms from previous operation), and (2) introduction of the process solutions to a steam stripping tower (T-J8, T-K4, T-H4).

2.5.4.4 Decanting

The feed solutions to concentrators E-F6 and E-N6 shall be pumped from unagitated tanks (TK-F7, TK-N1) in which the pump suctions are covered with aqueous solutions.

2.5.4.5 Vessel Pressure

The concentrator systems (E-J8, E-K4, E-H4, E-F6, E-N6) shall not be operated under positive pressure as measured by pot vacuum and differential pressure instrumentation. Accidental pressurization (positive) shall be immediately corrected.

2.5.4.6 Temperature Control

The concentrators and appropriate tanks (with the exception of the E-F11 Concentrator) are equipped with high temperature alarms set at 120° C. If any vessel solution temperature exceeds 120° C (except E-F11 concentrator), immediate action shall be taken to keep the temperature below the 125° C maximum.

2.5.4.7 Tank Heating

Tanks which contain organic phase and/or aqueous which may contain organic phase shall not be heated unless the liquid level completely covers the coil or the temperature of the liquid medium supplied to the coil is less than 65° C.

2.5.4.8 Dissolvers and Acid Boil-Off Vessel

No stream which might contain organic shall be routed to the dissolvers A3, B3 or C3, any D Cell vessels, or to E-F11.

2.5.5 Ammonia Hazards Control Standards

2.5.5.1 Dissolver System

The maximum NaOH addition rate to a dissolver containing aluminum metal and sodium nitrate solution shall be limited to less than 33 pounds per minute of 50 percent solution. The addition of NaOH to a dissolver shall be terminated and/or prohibited whenever the vessel is pressurized with respect to the cell.

2.5.5.2 The minimum solution temperature during waste neutralization in vessels TK-F15, TK-F16 and TK-F18, shall be 45° C as measured by in-vessel thermohms.
Note: See Section 2.5.4 for maximum operating temperatures.

2.5.6 Dissolver Erosion Standards

2.5.6.1 The maximum air supplied to the inner annulus lifter-circulator shall not exceed 300 scfm or 21 psi pressure drop on sparger orifices.

2.5.6.2 The air supplied to the outer annulus lifter-circulator shall not exceed 260 scfm or 21 psi pressure drop.

2.5.7 Fluoride Corrosion Control Standards

Aluminum nitrate shall be added to the dissolvers TK-A3, B3, C3, TK-F5 and TK-F3 as required to maintain an Al, (or Th) to F mole ratio of at least 3.0.

2.5.8 Sugar Denitration Standards

2.5.8.1 Sugar Concentration

a. The sugar concentration in TK-204 shall be less than 23.5 weight percent.

b. The maximum amount of sugar solution added to TK-F15 shall be less than 1.4 pounds of solution per pound of nitric acid in TK-F15.

2.5.9 Waste Neutralization Standards

2.5.9.1 Waste Routing

Wastes from thorium processing shall be routed to non-boiling storage via the 104-C pump tank.

2.5.9.2 Flushes

The sum of the Zr-Nb-95, Ru-103, RuRh-106 and CePr-144 in neutralized flushes routed to non-boiling storage during the thorium campaign shall not exceed a concentration of 3.5×10^7 µCi/gal or a total of 2.0×10^6 curies.

2.5.9.3 Records

Inventory records of batch volumes and Cs-137 concentration* for all waste transfers to non-boiling storage shall be maintained by Purex Operation Subsection and reported weekly to the Manager, Separations Process Engineering, for transmittal to the Manager, Waste Management Process Engineering.

* Cs-137 content may be determined from weekly composite samples.

2.5.10 APPROVALS FOR SECTION 2.5

Prepared by: R E Van der Cook — 7/14/70
Process Engineer - Separations Process Engineering — Date

Issued by: G L Ritter — 7-24-70
Manager - Separations Process Engineering — Date

Accepted by: O F Beaulieu — 7/26/70
Manager - Purex Operations — Date