START

ENGINEERING CHANGE NOTICE

0035791

Page 1 of 5

1. ECN 105401

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. Date
Supplemental [X] Direct Revision [ ] Change ECN [ ] Temporary [ ] Supersedure [ ] Discovery [ ] Cancel/Void [ ]	EE Borders, PUREX Systems & Technology, S6-01, 3-4202	July 5, 1989
	5. Project Title/No./Work Order No. KP7 B-669, Neutralization of Demineralizer Regeneration Effluents	6. Bldg./Sys./Fac. No. 211-A 7. Impact Level 2
	8. Document Number Affected (include rev. and sheet no.) SD-HS-SAR-001, Rev 5, 5-162	9. Related ECN No(s). N/A 10. Related PO No. N/A

11a. Modification Work	11b. Work Package Doc. No.	11c. Complete Installation Work	11d. Complete Restoration (Temp. ECN only)
[ ] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Substitute the attached paragraphs for subsection 5.4.5.4.1, Demineralized Water System, of SD-HS-SAR-001, Rev. 5.

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APPROVED FOR PUBLIC RELEASE

13a. Justification (mark one)	13b. Justification Details
Criteria Change [ ] Design Improvement [X] Environmental [ ] As-Found [ ] Facilitate Const. [ ] Const. Error/Omission [ ] Design Error/Omission [ ]	Description for processing effluent streams discharged from the regeneration of the spent ion exchange beds of the demineralizer water system. The description reflects changes caused by startup of the neutralization system implemented by Project B-669.

14. Distribution (include name, MSIN, and no. of copies)

DH Shuford	S6-01	1
GJ LeBaron	S5-80	1
GC Strickland	S6-05	1
DK Oestreich	R3-02	1

RELEASE STAMP

OFFICIAL RELEASE BY WHC 52

DATE JUL 06 1989

Sta #1

A-7900-013 (11/88)

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1. ECN (use no. from pg. 1) 105401

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
☐ Yes	Additional ☐	$ N/A	Additional ☐	$ N/A	Improvement ☐	N/A
☒ No	Savings ☐	$ N/A	Savings ☐	$ N/A	Delay ☐	N/A

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☒	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐		☐
Environmental Report	☐	Inspection Plan	☐		☐
Environmental Permit	☐	Inventory Adjustment Request	☐		☐

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number/Revision
PO-180-200 F-1		

20. Approvals

	Signature	Date		Signature	Date
OPERATIONS AND ENGINEERING			ARCHITECT-ENGINEER		
Cog./Project Engineer	EE Borders	6-7-89	PE		
Cog./Project Engr. Mgr.	RJ Thompson	6-7-89	QA		
QA	ST Smith	6/29/89	Safety		
Safety	RW Szempruch	6/30/89	Design		
Security			Other		
Proj.Prog./Dept. Mgr.					
Def. React. Div.					
Chem. Proc. Div.					
Def. Wst. Mgmt. Div.			DEPARTMENT OF ENERGY		
Adv. React. Dev. Div.					
Proj. Dept.	JW Kelly	7/6/89			
Environ. Div.	RJ Landon	7/5/89	ADDITIONAL		
IRM Dept.					
Facility Rep. (Ops)	MB Engelsen	6-29-89			
Other					

5.4.5.4.1. Demineralized Water System. As received, the sanitary water contains relatively large quantities of dissolved ionic impurities and must be purified before it is suitable for use as process water in the PUREX Plant. Purification is accomplished by passing the water through demineralizers.

Demineralization, or deionization, is a chemical exchange and adsorption process in which undesirable dissolved salts are removed from water. Adsorbents are selective with respect to either cations or anions therefore, a complete demineralization process includes contacting the water with both cation and anion exchange resins. Removal of dissolved salts is effected by exchange of an ion in the adsorbent structure for another in the solution being treated. In the PUREX Plant, an acidic adsorbent removes cations, and a basic adsorbent removes anions.

Three cation and three anion columns are used to meet the demand for PUREX process water. Filtered water enters the top of the cation columns and is routed from the bottom of the cation columns to the top of the anion columns. After contacting the resin bed of the anion exchanger, the water flows out the bottom of the column to the demineralizer water header and to the demineralized water storage tank (TK-30).

With use, the resin beds gradually become less effective for removing dissolved salts, and must be regenerated. Sulfuric acid is used to regenerate the cation units and sodium hydroxide is used to regenerate the anion units. Routine demineralizer operation consists of regenerating one cation unit and one anion unit after each has processed approximately 200,000 gal of sanitary water. A special regeneration manifold permits the isolation of the spent columns while the other columns remain on-line and continue to produce demineralized water. The regeneration cycle consists of three steps:

1. Backwash. Each bed is backwashed with water from the bottom (upflow) to remove trapped solids and to classify the resin bed.

2. Regenerate. The regeneration solutions (sulfuric acid and sodium hydroxide) are prepared batchwise for each resin bed. The motive force used to transfer the regenerant solutions is by water jets. Each regenerant solution enters the top of the appropriate resin bed column. To avoid contamination of the conductivity probe located on the anion column, the sample valve is closed. The probe measures the conductivity of the demineralized water during normal operation and is used to determine the need for column regeneration.

3. Rinse. After regeneration the resin bed is given a slow water rinse using jets to disperse the regeneration solution through the bed. The slow water rinse is terminated and a fast water rinse is initiated to flush excess regeneration solution from the resin bed.

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The cation and anion exchange resin columns co-regenerant streams which are dilute sodium hydroxide, sulfuric acid, and backwash and rinse water are mixed in the catch sump. The trenches and catch sump are coated concrete structures and do not leak to the soil column.

During normal operations, demineralizer water regeneration effluents are released to the catch sump and gravity drains via a 6 in. internal diameter pipe encased in a 10 in. internal diameter pipe to a 6,000 gal catch tank. Other chemically compatible liquids are pumped from the north trench to the catch sump. The catch tank is double walled and a leak detection sensor is located in the secondary containment. The contents of the catch tank are pumped to the neutralization system. The neutralization system is an automatically controlled process with three pH adjustment chambers and a final in-line pH monitor on the system outlet stream prior to release to a trench north of Building 211-A. The outlet stream released to the trench drains to the chemical sewer line which discharges to the 216-A-29 crib in accordance with the discharge permit. If the pH of the outlet stream is outside the control range, the stream is automatically diverted to the catch tank.

Two pumps are provided in the catch tank. The second pump serves as a backup if the on-line pump fails. These pumps and all mechanical piping connections are located in the main catch tank riser so that any leaks will drain back into the catch tank. All piping connections not over sumps are of welded/-bonded construction.

The neutralization tank, two 100 gal chemical feed storage tanks, metering pumps and associated piping are located in a concrete retention basin. The basin is coated with a sodium hydroxide and sulfuric acid resistant coating. The capacity of the retention basin is 110% of the neutralization tank's volume.

Table 5-12 summarizes the demineralizer operating parameters and time cycles.

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Table 5-12. Demineralizer Operating Parameters and Time Cycles

Operating Mode	Cation Flow Rate (gal/min)	Time Cycle	Anion Flow Rate (gal/min)	Time Cycle
Maximum desired flow rate of demineralized water	150	---	110	---
Normal service flow	125	48 h	85	72 h
Back wash	100	15 min	25	30 min
Regeneration	75	40 min	25	30 min
Slow rinse	40	45 min	20	45 min
Fast rinse	100	45 min	75	45 min

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