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Theta Pro2Serve Management Company, LLC

Environmental Management & Enrichment Facilities

Cold Standby Shutdown and Transition Planning

Deposit Removal Plan

September 2005

Portsmouth Gaseous Diffusion Plant, Piketon, Ohio

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Theta Pro2Serve Management Company, LLC
for the Portsmouth/Paducah Project Office
of the United States Department of Energy

TPMC/PORTS-6

Cold Standby Shutdown and Transition Planning Deposit Removal Plan

Date Issued – September 2005

Prepared for the
U.S. Department of Energy
Portsmouth Paducah Project Office

Theta Pro2Serve Management Company LLC
managing the
Infrastructure Activities at the
Portsmouth Gaseous Diffusion Plant
under contract DE-AC24-05OH20193
for the
U.S. DEPARTMENT OF ENERGY

CONTENTS

FIGURES

TABLES

ACRONYMS

ASM	always-safe mass
CSB	cold standby
D&D	decontamination and decommissioning
DR	deposit removal
ETTP	East Tennessee Technology Park
GSM	greater than safe mass
HEU	highly enriched uranium
HP	health physics
IH	industrial hygiene
LTLT	low temperature long term
NCS	nuclear criticality safety
NDA	non-destructive assay
PEH	planned expeditious handling
PI	performance indicators
PORTS	Portsmouth Gaseous Diffusion Plant
S&M	surveillance and maintenance
Tc-99	technetium
UF_4	uranium tetrafluoride
UO_2F_2	uranyl fluoride
USEC	United States Enrichment Corporation

1. PURPOSE

In order to reduce both risk and Surveillance and Maintenance (S&M) costs during the Cold Shutdown period, it is proposed that known uranium deposits above the always-safe mass (ASM) in the process equipment (converters, compressors and coolers) be remediated to below the ASM limit. The remediation will be accomplished using either gas treatments (running cell, static gas charge or Low Temperature Long Term (LTLT)) or mechanical removal/clean out techniques. The specific remediation will be selected for each deposit depending on the size, location, and composition of the deposit as well as the available resources to accomplish the task safely.

2. INTRODUCTION

2.1 BACKGROUND

During the Cold Standby (CSB)/Deposit Removal (DR) program, 72 of 80 cells in the X-333 were treated with fluorinating gas in order to reduce the cell deposit hold-up. Per the most current neutron non-destructive assay (NDA) measurements, only cells 33-7-8 and 33-8-10 have components with deposits that exceed ASM limits.

During the CSB/DR program 48 of 110 cells in X-330 were treated with fluorinating gas in order to reduce the deposit hold-up in these cells. In addition, 10 known Planned Expeditious Handling (PEH) deposits within auxiliary equipment in the X-330 were treated. NDA measurements have been completed on most all of the equipment in this facility. The most current NDA data available for major cell equipment components shows the PEH and Greater than Safe Mass (GSM) deposits in the X-330 as listed in Appendix A. In summary, there are 8 known GSM and 23 known PEH deposits in this facility. A plan to disposition each deposit is presented.

All 200 cells of the X-326 facility were chemically treated to remove deposits during the Highly Enriched Uranium (HEU) Suspension Program ending in 1996. At that time, according to DOE guidelines, all deposits were reduced to less than ASM. However, after completion of the HEU Suspension Program, the nuclear criticality standards were revised to require the addition of measurement error in estimating the deposit mass. When this error was added, over 400 deposits exceeded the ASM limit and were classified as PEH. Upon completion of the HEU Suspension Program, an S&M program was established. The S&M program has identified more potential PEH deposits.

The United States Enrichment Corporation (USEC) is currently performing NDA re-measurements on 440 of the approximately 8000 pieces of process equipment as well as performing NDA measurements on auxiliary equipment, valves and process piping in the X-326 facility. These measurements are planned for completion by September 30, 2005, except for equipment in service for the DR and Technetium (Tc-99) Cleanup projects. To date most of the identified PEH deposits have been found in the compressor seal area.

2.2 PROCEDURES

Gas treatments of deposits will follow USEC procedures. Both gas recovery and NDA measurements will be made following the treatment. The gas treatment will be continued through the planned treatment duration or until the NDA measurement indicates the remaining deposit is less than ASM including the measurement error. However, if treatment data analysis indicates the treatment is not effective and that the deposit will not be removed within the planned treatment duration, the gas treatment will be terminated and other deposit removal options will be evaluated.

Mechanical clean out techniques will follow safe work practices. Standard work practices for opening process gas systems will be followed. Personnel will adhere to all Industrial Hygiene/Health Physics (IH/HP) and Nuclear Criticality Safety (NCS) controls. All material removed from the process equipment will be measured or estimated.

During the course of this work, if new observations or data indicate that a change is needed to safely and efficiently complete the deposit remediation, then those data will be documented and the removal plan will be modified.

2.3 PLAN OBJECTIVES AND PERFORMANCE MONITORING

Performance of this work plan will be monitored. The key objectives of the plan will be: 1) complete the deposit remediation within the baseline budget, 2) complete the project within the project schedule, 3) complete the project without environmental insult, 4) complete the project within all regulatory constraints, and 5) complete the project safely. Corresponding to the project objectives, a set of performance indicators (PI) will be utilized to monitor the project. These PIs will include: Actual cost versus baseline budget plan, project schedule versus the baseline schedule plan, a listing of project environmental and other regulatory exceedances, and RII/LWC performance during this project. A monthly status report will update the above PIs and provide a narrative of the task progress, significant issues, areas not meeting performance expectations and recovery plans to meet the task objectives.

3. REMEDIATION STRATEGY OF MAJOR CELL COMPONENTS

Appendix A shows the known deposits in the X-333 and X-330 that are above the ASM limit along with the specific deposit removal plan for each deposit.

3.1 X-333

Per the most current neutron NDA measurements, only cells 33-7-8 and 33-8-10 have components with deposits that exceed ASM limits. These deposits are in converters and based on the neutron NDA data, the deposit is spread throughout the converter. The schematic diagram shown in Fig. 1 represents the approach to remediating these deposits.

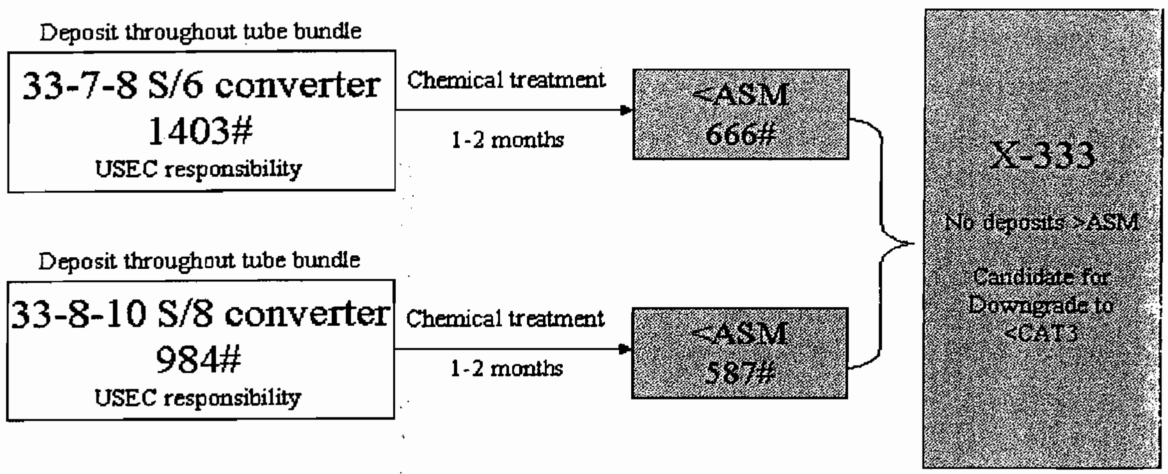

Fig. 1. Approach for remediating deposits in cells 33-7-8 and 33-8-10.

The NDA and NCS staff should evaluate these two converters using the available neutron measurements and deposit removal recovery data to assure that these deposits are truly greater than ASM and worthy of cell treatments. If chemical treatment is warranted, it should be noted that maintenance has been performed on both cells to give the cells an acceptable leak rate in order to fluorinate the cells. If further maintenance is not cost prohibitive, the cells could be started and a running cell treatment could be performed. This will have the advantage of some additional heat for the treatment as well as gas circulation, which will minimize the necessary treatment time. On the other hand, if maintenance is too costly to run these cells, then the above ASM converter in one cell could be removed and installed in the other cell. Static gas treatment could be used to treat both deposits at the same time. A third option is to perform a static treatment of both cells independently. The most cost effective option in the time allowed should be chosen.

3.2 X-330

There are several known above ASM deposits in the X-330. The largest known deposit is in cell 31-4-2 stage 10 converter. This cell was treated during the CSB/DR program. Upon final NDA, a large deposit was found to be in the cell. It would be prudent to inspect this cell prior to treatment. If the deposit is uranyl fluoride (UO_2F_2) and it appears to be spread throughout the converter, then we recommend that the cell be treated using an inverse running treatment. This will provide the best chance for gas circulation during the treatment and a reduction in overall cell treatment time. If the running treatment is not effective after about a month, then an LTLT treatment would be appropriate. The diagram shown in Fig. 2 illustrates the remediation strategy for this major deposit.

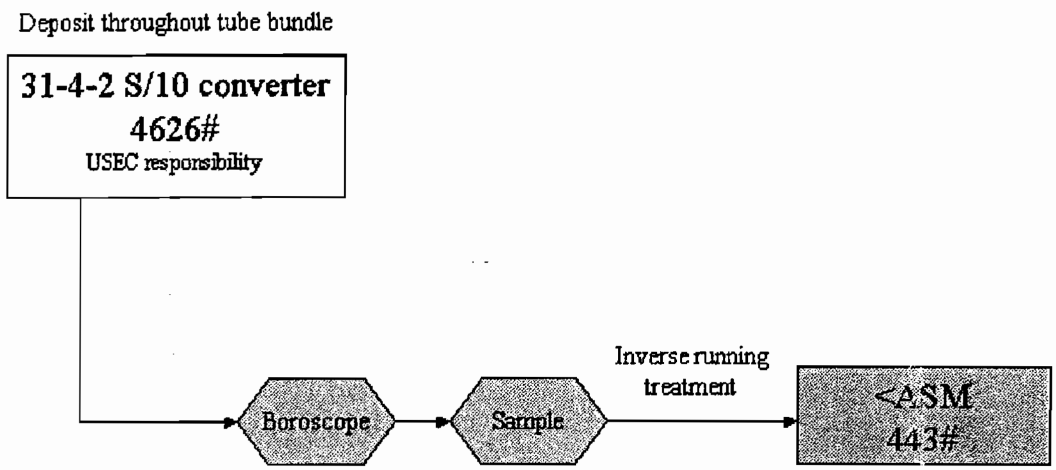

Fig. 2. Approach for remediating deposit in cell 31-4-2.

Other deposits in the X-330 should also be inspected prior to treating the deposit. Included among these are the deposits found in 29-5-2. Again, if the deposit is verified to be UO_2F_2, then we recommend an LTLT gas treatment as shown in Fig. 3 below.

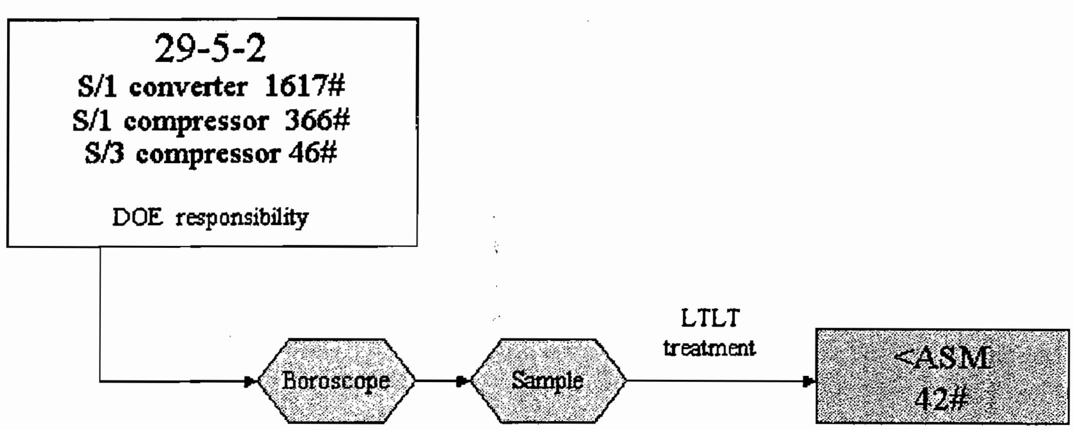

Fig. 3. Approach for remediating deposits in cell 29-5-2.

Cell 29-6-5, also contains a large above ASM deposit. However, this converter deposit is likely in the A-line piping. We recommend an inspection of this converter to verify the location and sample composition of the deposit. If it is found to be in the A-line, then the remediation schedule could be shortened by cutting the A-line and mechanically removing the deposit. The treatment diagram for this cell is shown in Fig. 4.

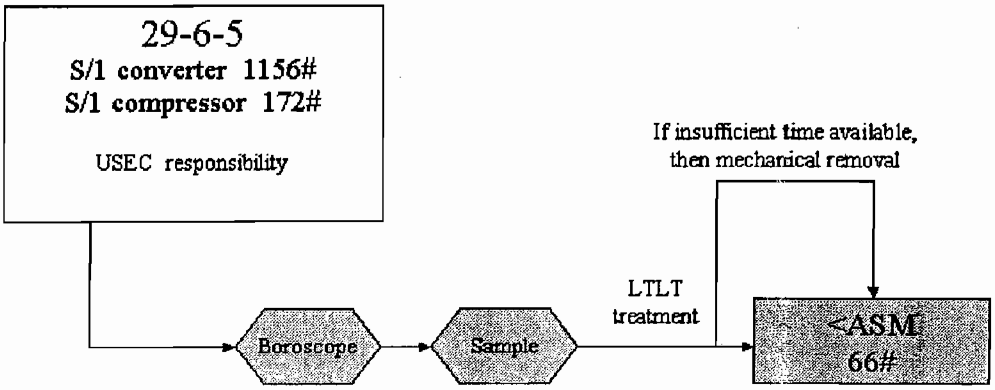

Fig. 4. Approach for remediating deposits in cell 29-6-5.

Cell 29-4-10 has a deposit in the stage 2 compressor. The treatment diagram for this cell is shown below in Fig. 5. The deposit may be in the B-end of the compressor. An LTLT treatment of this deposit should effectively remove it. However, if the treatment is not effective or if the remediation schedule needs to be shortened, then the compressor should be removed, remeasured by NDA in a low background area, then dismantled and cleaned in the X-705 facility if required.

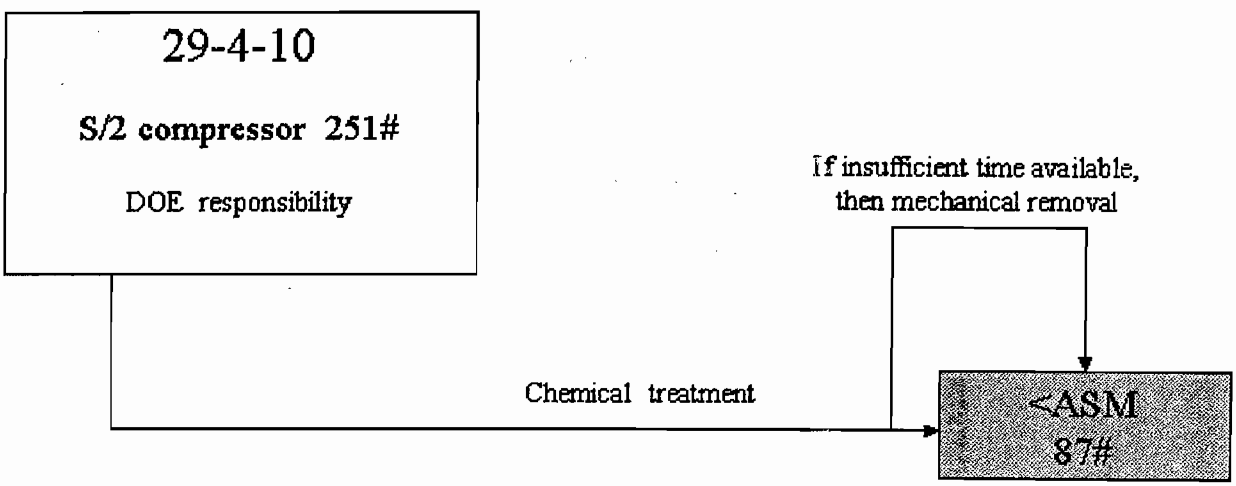

Fig. 5. Approach for remediating deposit in cell 29-4-10.

Seven other cells in X-330 contain PEH deposits. These cells were not treated for deposit removal during the CSB program. Although they were shut down for a variety of reasons, no historical data on these cells would indicate that the deposit would be resistant to chemical treatment. The cells do not have very large deposits. Hence, a static cell treatment in each case is recommended. Fig. 6 depicts the cells to be treated in this manner.

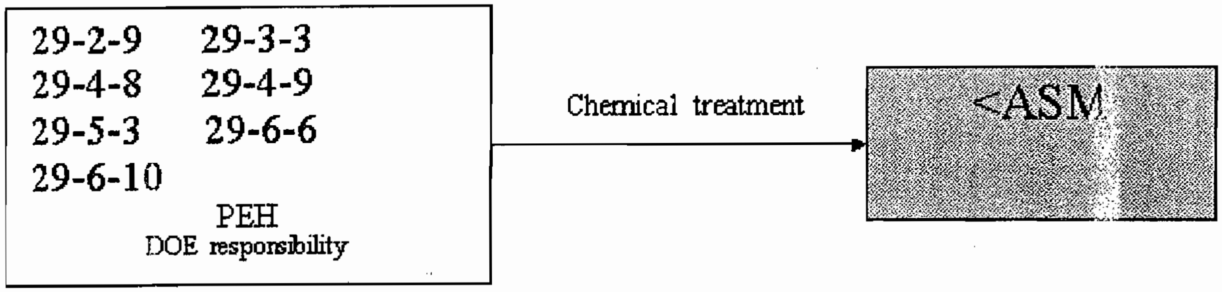

Fig. 6. Approach for remediating PEH deposits in X-330.

In addition, cell 31-3-6 contains a PEH deposit in the stage 7 converter. This cell was treated during the CSB/DR program. However, when the final NDA measurements of the cell were completed, the PEH deposit was discovered. This cell was operated until April 2001 prior to cell shutdown. There are no current indications that this deposit is localized in the converter. Therefore, it is assumed that the deposit is spread throughout the converter. Based on this assumption and the size of the measured deposit, a static cell treatment is recommended as shown in Fig. 7.

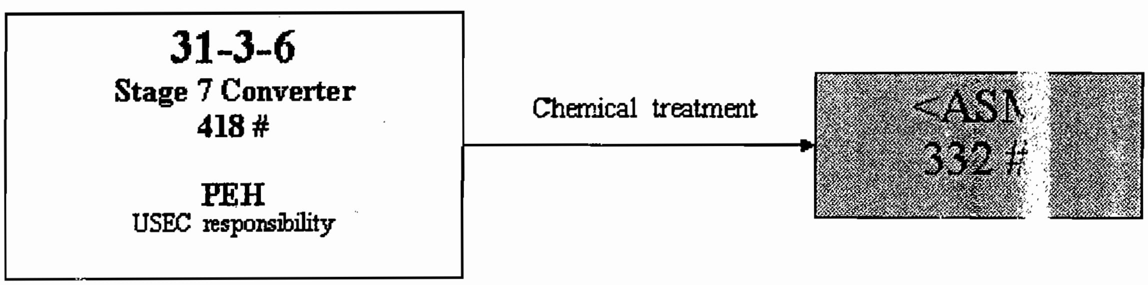

Fig. 7. Approach for remediating deposit in cell 31-3-6.

Cell 31-3-10 experienced an exothermic reaction prior to shutdown in 1991. Recently, USEC inspected this cell with a boroscope and found the deposit to be located only at the bottom of the Stage 10 converter. Furthermore, samples of the deposit were identified to be uranium tetrafluoride (UF_4) by x-ray techniques. At this time, we do not believe that treatment of this deposit will be needed. We recommend a reanalysis of the neutron NDA data on this converter. Since the original analysis assumed that the chemical composition was UO_2F_2, we anticipate that the re-analysis using a UF_4 composition will estimate a lower mass of uranium holdup in the converter. If the new estimate of the deposit mass is still above ASM, then we recommend to open the converter in place and mechanically remove the deposit from the bottom of the converter shell. The treatment diagram for this cell is shown below in Fig. 7.

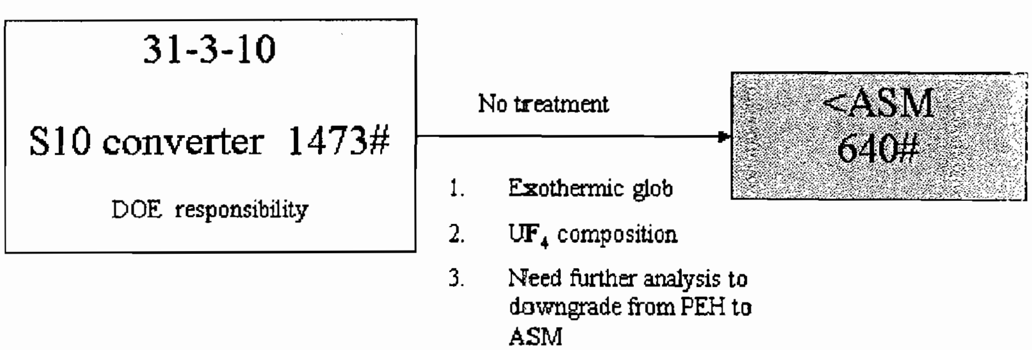

Fig. 8. Approach for remediating deposit in cell 31-3-10.

Finally, cell 29-6-1 in X-330 has a deposit slightly above ASM in the Stage 8 compressor. The mass has been measured by neutron NDA since the thickness of the compressor metal prohibits effective gamma measurements. We recommend removing the B-seal and remeasuring this compressor since it is likely that a significant part of the deposit has accumulated around the seal. If needed the compressor should be removed to a low neutron background area and remeasured in order to eliminate possible interference from the holdup uranium in nearby equipment. If the compressor deposit still exceeds ASM, it should be transported to X-705 using existing procedures, then dismantled and cleaned to below the ASM limit. The treatment diagram for this cell is shown in Fig. 8.

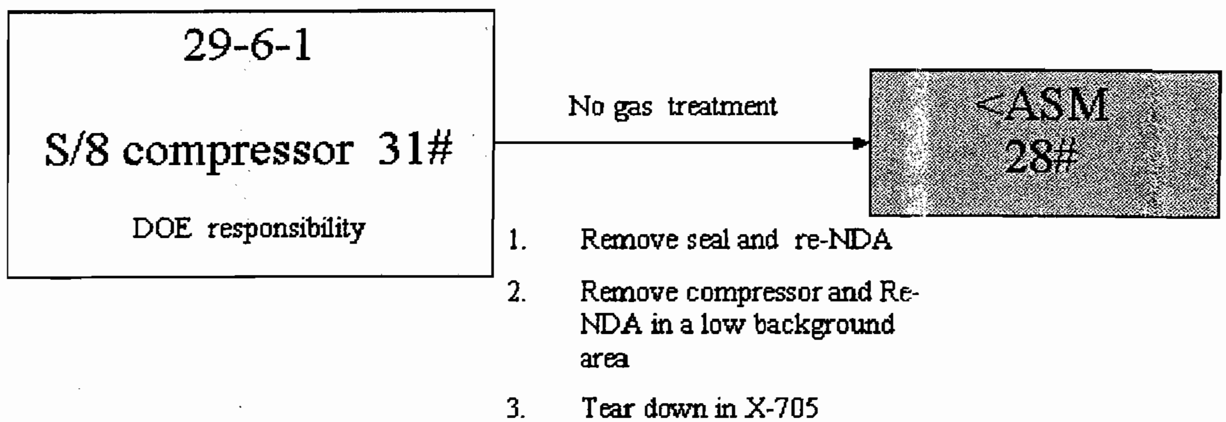

Fig. 9. Approach for remediating deposit in cell 29-6-1.

3.3 X-326

All 200 cells of the X-326 facility were chemically treated to remove deposits during the HEU Suspension Program ending in 1996. Upon completion of the HEU Suspension Program, an S&M program was established. The S&M program has remeasured each cell at least once every 2 years. During the course of these measurements when measurement error is included, many cell components have exceeded the ASM limit. In fact, utilizing the database of all S&M measurements of the X-326 cells, only 20 of the 200 cells have never exceeded the ASM limit for all components in the cell. These 20 cells are listed in Table 1.

Table 1. X-326 cells less than ASM

25-1-14	25-1-16	25-1-18	25-3-13
25-4-2	25-6-5	25-7-5	25-7-6
25-7-8	25-7-10	25-7-12	25-7-19
25-7-20	27-1-9	27-1-10	27-1-11
27-1-13	27-1-16	27-1-17	27-3-2

A further analysis of the NDA data for key cell components (compressors, converters and coolers) has been completed and summarized in Table 2.

Table 2. NDA analysis of X-326 key cell components

	Compressors	Converters	Coolers
All measurements less than ASM	1866	2122	2277
All measurements greater than or equal to the ASM	33	10	6
Some measurements less than and some greater than the ASM	481	248	97

Based on this analysis, several courses of action are required to successfully remediate the deposits in X-326 cell equipment. First, gamma measurements should be made of the 258 converters that are always or sometimes above the ASM limit. Because the original neutron NDA measurements are indirect measurements (the detected neutrons are mostly from Fluorine) and since the neutron measurements are subject to greater interference from nearby uranium sources, these measurements are generally biased high. On the other hand, gamma NDA measurements are direct measurements of uranium and the passive gamma measurements are more focused and hence subject to less interference and bias. Therefore, we expect that the gamma measurements will reflect a mass closer to the true value and smaller than the original estimate of the deposit mass. In the event that any X-326 converters are above ASM after they are remeasured with gamma detectors, then they could be removed to X-705 for disassembly and cleaning or addressed during decontamination and decommissioning (D&D) operations in a manner similar to East Tennessee Technology Park (ETTP).

Second, the 514 compressors in X-326 that are always or sometimes above the ASM limit should be mechanically cleaned by removing the seals and cleaning the seal and labyrinth area. All uranium material removed should be transferred to an always-safe geometry container. After cleaning the area, a dresser seal should be applied and a new NDA measurement of the compressor performed. In the event that the compressor is still above the ASM limit, then it should be removed to a low background area and remeasured. If this remeasurement is still above the ASM limit, then it could be moved to the X-705 for disassembly and cleaning or addressed during D&D operations in a manner similar to ETTP.

Third, the 103 coolers in X-326 that are always or sometimes above the ASM limit should be remeasured using neutron coincidence counting techniques. This technique is much less susceptible to interference from nearby neutron sources. Hence, we expect that this method will remove some of the high bias associated with passive neutron measurements. The deposit measurements are expected to be lower and closer to the true value. In the event that coolers are still above the ASM limit using this improved measurement technique, they should be removed and transported to X-705 for disassembly and cleaning or addressed during D&D operations in a manner similar to ETTP.

4. SCHEDULE

The time line schedule for completing this work plan is shown in Fig. 9 below.

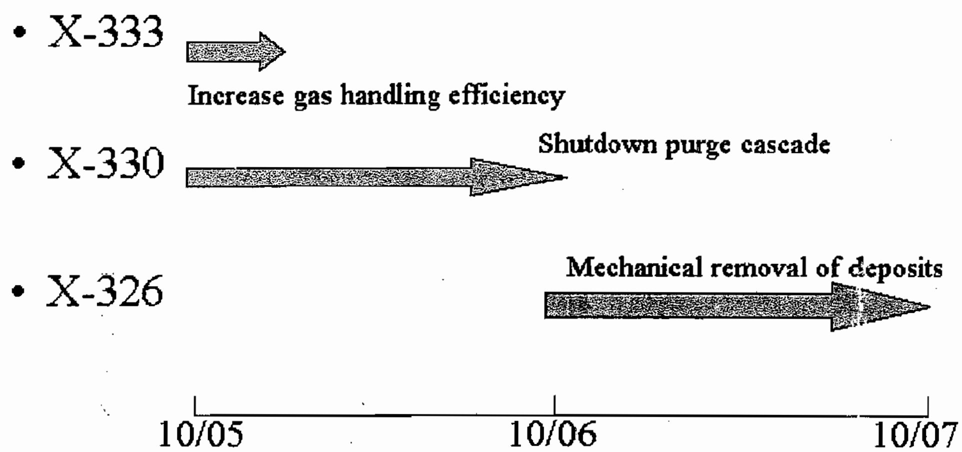

Fig. 10. Time line schedule for completing work plan.

All deposit removal work should be completed in the X-333 by February 2006. Deposit removal work in the X-330 will be initiated concurrently with X-333. However, the X-330 deposit removal work plan will require effort through September 2006. Although the recommended NDA measurements in X-326 should begin in FY06, no actual deposit remediation is planned until FY07. Based on available resources, the campaign to mechanically remove deposits in X-326 will begin about October 2006 and will likely last for about one year.

5. MISCELLANEOUS PROCESS EQUIPMENT

In addition to the major cell components shown in Appendix A, there are other process equipment items that have been measured to contain greater than the ASM deposits. These items are shown in Appendix B and Appendix C. Follow-up NDA measurements on many of these components are required. In order to obtain the best possible measurement, additional steps including removal of valve housings, measurements with shorter standoff distance, and utilization of gamma technology or neutron coincidence counting may be needed.

In a number of cases in the X-330 facility, these items will be gas treated when possible as a part of the planned treatment of the nearby cell components. Following treatment these components will be re-measured using best available NDA technology. Where gas treatment is not practical and the best NDA measurements indicate a deposit greater than the ASM limit, the equipment could be removed and taken to the X-705 for disassembly and cleaning.

6. TECHNETIUM MEASUREMENTS

The gaseous diffusion process equipment at the Portsmouth Gaseous Diffusion Plant (PORTS) has been contaminated with detectable amounts of Tc-99 derived from enrichment processing of Paducah product. Much of the Tc-99 has been removed during equipment change-out campaigns. Further reduction in Tc-99 has been achieved periodically by "hot treatment" of the cell equipment and subsequent purging to drive off volatile Tc-99 compounds. However, the purge cascade, some X-326 isotopic cells, surge drums, and associated piping has been re-exposed to Tc-99 during the current Tc-99 clean-up of contaminated cylinder assets. Hence, the Tc-99 contamination should be reduced by "hot treatment" of the cells and equipment in this part of the cascade at the completion of this project. Since Tc-99 contributes to the radiological hazard of process equipment, it is important to reduce this contamination to as low as reasonable and then to estimate the extent of the remaining Tc-99 contamination.

Based on years of experience, the greatest Tc-99 contamination accumulates in the upper part of the enrichment cascade. Therefore, the greatest benefit will be derived from Tc-99 measurements in this area.

In situ measurements of Tc-99 may be accomplished using laser ablation techniques. In this case, an opening in the equipment could be drilled to allow insertion of the laser instrument probe. The laser heats the equipment surface and consequently volatilizes Tc-99 compounds, which are then detected by spectroscopy of the hot gases desorbed from the surface. These measurements could be used to map the locations with greatest Tc-99 contamination. Furthermore, based on these data, the level of Tc-99 contamination can be quantitatively estimated.

7. SUMMARY

The remaining PEH deposits can be remediated to less than the ASM limit during FY06 and FY07. Gas treatments of deposits will be required in FY06 for both the X-333 and X-330 facilities. Some mechanical deposit remediation will also be required in the X-330. This plan describes the specific approach to remediate each deposit in X-333 and X-330.

The X-326 poses a unique challenge. Due to the enrichment of the holdup uranium in this facility, the ASM limit is low. The high bias of neutron NDA measurements frequently complicates the interpretation of these holdup measurements. A statistical analysis of neutron NDA measurements versus the actual amount removed from cells should be done to reduce the neutron NDA bias and error. Furthermore, this plan describes an X-326 campaign to remeasure all converters that have been identified as above ASM at any time since the HEU Suspension program ended using gamma NDA techniques. In addition, improved NDA techniques should be attempted for coolers that have exceeded the ASM limit. Finally, this plan recommends a campaign to remediate compressors that have exceeded ASM by removing the seal and recovering the uranium holdup in an always-safe geometry container.

Removing the above ASM deposits from process equipment in X-333, X-330 and X-326 will reduce risk and reduce S&M costs during the Cold Shutdown period. Furthermore, removing these deposits now will facilitate future D&D of the facilities.

APPENDIX A

LEU DEPOSIT TREATMENT PLAN

LEU Deposit Treatment Plan

Cell	Shutdown	Converter	Compressor	ASM	Recommended Treatment	Treatment Duration	Responsibility
29-2-6	9/92	PEH- S/4 165 lb		83 lb	Static gas	1 mo.	DOE
29-2-9	9/92	PEH- S/3 259 lb PEH- S/7 156 lb		139 lb	Static gas	1 mo.	DOE
29-3-3	8/88	PEH- S/5 78 lb		43 lb	Static gas	1 mo.	DOE
29-4-4	12/91	GSM- S/6 2882 lb		85 lb	LTLT	Until 10/01/05	DOE
29-4-5	12/98	PEH- S/3 78 lb PEH- S/8 61 lb		54 lb	Static gas	1 mo.	USEC
29-4-8	2/96	PEH- S/2 84 lb PEH- S/3 96 lb PEH- S/5 151 lb		82 lb	Static gas	1 mo.	DOE
29-4-9	3/96	PEH- S/9 136 lb		92 lb	Static gas	1 mo.	DOE
29-4-10	2/96		PEH- S/2 251 lb	87 lb	Static gas (mechanical removal if gas is not effective)	1 mo.	DOE
29-5-2	9/96	GSM- S/1 1617 lb	PEH- S/3 46 lb GSM- S/1 366 lb	42 lb	LTLT	3 mo.	DOE
29-5-3	6/97	PEH- S/1 59 lb PEH- S/6 78 lb	PEH- S/1 114 lb PEH- S/6 118 lb	59 lb	Static gas	1 mo.	DOE
29-5-8	5/95	GSM- S/8 1693 lb		45 lb	LTLT	Until 10/01/05	DOE
29-6-1	7/90		PEH- S/8 31 lb	28 lb	Remove seal and remeasure	1 mo.	DOE

LEU Deposit Treatment Plan (Continued)

Cell	Shutdown	Converter	Compressor	ASM	Recommended Treatment	Treatment Duration	Responsibility
29-6-5	8/00 – original 3/02 – after treatment	GSM- S/1 1156 lb	PEH- S/1 172 lb	66 lb	LTLT or Mechanical removal	3 mo.	USEC
29-6-6	7/90	PEH- S/8 26 lb		24 lb	Static gas	1 mo.	DOE
29-6-10	7/90	PEH- S/1 78 lb	PEH- S/1 25 lb	21 lb	Static gas	1 mo.	DOE
31-3-6	4/01	PEH- S/7 418 lb		332 lb	Static gas	1 mo.	USEC
31-3-10	2/91	PEH- S/10 1473 lb		640 lb	Mechanical removal	3 mo.	DOE
31-4-2	4/01 – original 12/02 – after treatment	GSM-S/10 4626 lb		443 lb	Inverse running treatment	12 mo	USEC
33-7-8	11/00	GSM- S/6 1403 lb		666 lb	Static gas	2 mo.	USEC
33-8-10	09/99	GSM- S/8 984 lb		587 lb	Static gas	2 mo.	USEC
Total		**16 PEH/7 GSM**	**7 PEH/1 GSM**				

APPENDIX B

X-326 PEH PIPES, TRAPS, and VALVES

X-326 PEH Pipes, Traps, and Valves

Equipment Description	Reference Memo
6 inch dia. Pipe, purge system Exhauster Station, Group E	POEF-38-344-05-373
Wet Air Station, Area 4, Increment #3 Pumps, Increment #1 Traps, Increment #2 Piping of 1 inch, 2 inch, 3 inch and 4 inch Diameter	POEF-38-344-05-299
Group C, Pipe, Purge System, Exhauster Station, Increment #1 3 inch pipe, Increment #2 4 inch pipe and Increment #3 6 inch pipe	POEF-38-344-05-299
Group D, Pipe, Purge System, Exhauster Station, Increment #1 valve, Increment #2 4 inch pipe and Increment #3 6 inch pipe.	POEF-38-344-05-299
Group F, Valve, Purge System, Exhauster Station Increment #1 ET11, Increment #2 EBP1, Increment #3 E7WA1, Increment #4 DBJ1, Increment #5 DJB-1, Increment #6 DJ2 and Increment #7 B1D	POEF-38-344-05-309
26-EB-1, Cooler Evacuation, EBS	POEF-38-344-05-309
26-EB-2, Cooler, Evacuation, EBS	POEF-38-344-05-309
25-5 Block Valves 3BB1	POEF-38-344-05-309
25-5 Block Valves 3BB2	POEF-38-344-05-309
25-5 Block Valves 5BB2	POEF-38-344-05-309
25-5 Block Valves 3AB2	POEF-38-344-05-309
25-5 Recycle Valve 6R	POEF-38-344-05-309
27-1 Unit Bypass valve D1ASPR	POEF-38-344-05-262
27-1 Unit Bypass valve 1DE2	POEF-38-344-05-262

X-326 PEH pipes, traps, and valves (continued)

Equipment Description	Reference Memo
27-1 Unit Bypass valve D1XB	POEF-38-344-05-262
27-1 Unit Bypass valve D1XA	POEF-38-344-05-262
25-7-2, 2AB1 (A-Inlet) valve	POEF-38-344-067
25-7-2, 2R (Recycle) valve	POEF-38-344-067
SEx Station Discharge pipe, Evacuation system, Area 4	POEF-38-344-05-168
SEx Station Suction pipe, Evacuation system, Area 4	POEF-38-344-05-168
SEx Trap Manifolds pipe, Evacuation system, Area 4	POEF-38-344-05-168
27-2-2, 2R valve	POEF-38-344-05-171
27-1-10, 10R valve	POEF-38-344-05-171
27-2-11, 11BB2 valve	POEF-38-344-05-171
25-2-11, 11R valve	POEF-38-344-05-171
25-4-11, 11R valve	POEF-38-344-05-171
25-3-12, 12R valve	POEF-38-344-05-171
25-4-13, 13AB1 valve	POEF-38-344-05-171
25-1-13, 13R valve	POEF-38-344-05-171
25-2-13, 13R valve	POEF-38-344-05-171
25-5-14, 14R valve	POEF-38-344-05-171
25-3-16, 16R valve	POEF-38-344-05-171

X-326 PEH pipes, traps, and valves (continued)

Equipment Description	Reference Memo
25-2-17, 17R valve	POEF-38-344-05-171
27-1-18, 18AB2 valve	POEF-38-344-05-171
27-1-18, 18BB1 valve	POEF-38-344-05-171
25-7-19, 19BP valve	POEF-38-344-05-171
25-4-1, 1AB1 valve	POEF-38-344-05-171
25-5-20, 20AB2 valve	POEF-38-344-05-171
25-5-20, 20BB1 valve	POEF-38-344-05-171
25-4-20, 20R valve	POEF-38-344-05-171
25-3-2, 2AB2 valve	POEF-38-344-05-171
25-7-2, 2AP valve	POEF-38-344-05-171
25-4-4, 4AB2 valve	POEF-38-344-05-171
25-4-4, 4BB1 valve	POEF-38-344-05-171
25-4-5, 5AB1 valve	POEF-38-344-05-171
25-4-5, 5BB2 valve	POEF-38-344-05-171
27-1-6, 6R valve	POEF-38-344-05-171
25-3-6, 6R valve	POEF-38-344-05-171
25-7 unit bypass valve, 7EA1	POEF-38-344-05-171
25-5-7, 7R valve	POEF-38-344-05-171

X-326 PEH pipes, traps, and valves (continued)

Equipment Description	Reference Memo
25-2-8, 8R valve	POEF-38-344-05-171
25-2 unit bypass valve, E2XA	POEF-38-344-05-171
25-2 unit bypass valve, E2XB	POEF-38-344-05-171
25-2 unit bypass valve, E2XE	POEF-38-344-05-171
25-6 unit bypass valve, E6ASP	POEF-38-344-05-171
25-7 unit bypass valve, E7XA	POEF-38-344-05-171
25-7 unit bypass valve, E7XB	POEF-38-344-05-171
25-7 unit bypass valve, E7XE	POEF-38-344-05-171
25-7 unit bypass valve, E7XSPR	POEF-38-344-05-171
25-7-1, SPE1 valve	POEF-38-344-05-171
25-7 SPRE1 valve	POEF-38-344-05-171

APPENDIX C

X-330 PEH PIPES, TRAPS, and VALVES

X-330 PEH pipes, traps, and valves

Equipment Description	Reference Memo
SEx Evacuation Header pipe, Inc#1 and Inc#2 (This is PEH only if the pipe is cut in greater than 10ft length)	POEF-38-344-05-395
2CA-1 unit bypass valve	POEF-38-344-05-280
2CB-1 unit bypass valve	POEF-38-344-05-280
3CA-1 unit bypass valve (GSM)	POEF-38-344-05-280
3CB-1 unit bypass valve	POEF-38-344-05-280
4CA-1 unit bypass valve	POEF-38-344-05-280
4CB-1 unit bypass valve	POEF-38-344-05-280
5BB-1 unit bypass valve	POEF-38-344-05-280
5CA-1 unit bypass valve	POEF-38-344-05-280
5CB-1 unit bypass valve	POEF-38-344-05-280
6CA-1 unit bypass valve	POEF-38-344-05-280
6CB-1 unit bypass valve	POEF-38-344-05-280
8BB1 block valve (GSM)	POEF-38-344-05-285
1AB1 block valve (GSM)	POEF-38-344-05-285
5BB2 block valve (GSM)	POEF-38-344-05-285
5BB1 block valve (GSM)	POEF-38-344-05-285
3BB1 block valve (GSM)	POEF-38-344-05-285

X-330 PEH pipes, traps, and valves (continued)

Equipment Description	Reference Memo
6BB2 block valve (GSM)	POEF-38-344-05-285
6BB1 block valve, 29-5	POEF-38-344-05-285
6R Recycle valve, 29-5	POEF-38-344-05-285
2BB1 block valve, 29-6	POEF-38-344-05-285
3BB2 block valve, 29-2	POEF-38-344-05-285
3AB1 block valve, 29-2	POEF-38-344-05-285
1BB1 block valve, 29-3	POEF-38-344-05-285
3BB1 block valve, 29-3	POEF-38-344-05-285
5BB1 block valve, 29-3	POEF-38-344-05-285
10BB1 block valve, 29-3	POEF-38-344-05-285
10BB2 block valve, 29-3	POEF-38-344-05-285
6BB2 block valve, 29-3	POEF-38-344-05-285
2BB1 block valve, 29-3	POEF-38-344-05-285
5AB2 block valve, 29-3	POEF-38-344-05-285
7AB1 block valve, 29-3	POEF-38-344-05-285
7AB2 block valve, 29-4	POEF-38-344-05-285
9AB2 block valve, 29-4	POEF-38-344-05-285
2BB2 block valve, 29-4	POEF-38-344-05-285

X-330 PEH pipes, traps, and valves (continued)

Equipment Description	Reference Memo
5BB1 block valve, 29-5	POEF-38-344-05-285
4BB1 block valve, 29-5	POEF-38-344-05-285
4BB2 block valve, 29-5	POEF-38-344-05-285
2BB1 block valve, 29-5	POEF-38-344-05-285
2BB2 block valve, 29-5	POEF-38-344-05-285
1BB2 block valve, 29-6	POEF-38-344-05-285
3BB1 block valve, 29-5	POEF-38-344-05-285
10BB1 block valve, 29-6	POEF-38-344-05-285
6BB1 block valve, 29-6	POEF-38-344-05-285
6BB2 block valve, 29-6	POEF-38-344-05-285
2BB2 block valve, 29-6	POEF-38-344-05-285
9BB1 block valve, 31-3	POEF-38-344-05-285
1R Recycle valve, 29-4	POEF-38-344-05-285
3R Recycle valve, 29-4	POEF-38-344-05-285
5R Recycle valve, 29-4	POEF-38-344-05-285
29-5-5BP cell bypass valve (GSM)	POEF-38-344-05-261
29-5-10BP cell bypass valve	POEF-38-344-05-261
29-5-1AP cell bypass valve	POEF-38-344-05-261

X-330 PEH pipes, traps, and valves (continued)

Equipment Description	Reference Memo
29-5-1BP cell bypass valve	POEF-38-344-05-261
29-5-2AP cell bypass valve	POEF-38-344-05-261
29-5-2BP cell bypass valve	POEF-38-344-05-261
29-5-3AP cell bypass valve	POEF-38-344-05-261
29-5-3BP cell bypass valve	POEF-38-344-05-261
29-5-4AP cell bypass valve	POEF-38-344-05-261
29-5-4BP cell bypass valve	POEF-38-344-05-261
29-5-8AP cell bypass valve	POEF-38-344-05-261
29-5-8BP cell bypass valve	POEF-38-344-05-261
29-5-9AP cell bypass valve	POEF-38-344-05-261
29-6-1AP cell bypass valve	POEF-38-344-05-261
29-6-1BP cell bypass valve	POEF-38-344-05-261
29-6-2AP cell bypass valve	POEF-38-344-05-261
29-6-2BP cell bypass valve	POEF-38-344-05-261
29-6-3AP cell bypass valve	POEF-38-344-05-261
29-6-3BP cell bypass valve	POEF-38-344-05-261
29-2 6BP cell bypass valve	POEF-38-344-05-177
29-3 1BP cell bypass valve	POEF-38-344-05-177

X-330 PEH pipes, traps, and valves (continued)

Equipment Description	Reference Memo
29-3 3BP cell bypass valve	POEF-38-344-05-177
29-3 3AP cell bypass valve	POEF-38-344-05-177
29-3 5AP cell bypass valve	POEF-38-344-05-177
29-3 10BP cell bypass valve	POEF-38-344-05-177
29-3 10AP cell bypass valve	POEF-38-344-05-177
29-3 6AP cell bypass valve	POEF-38-344-05-177
29-3 2BP cell bypass valve	POEF-38-344-05-177
29-3 1AP cell bypass valve	POEF-38-344-05-177
29-4 9AP cell bypass valve	POEF-38-344-05-177
29-4 10BP cell bypass valve	POEF-38-344-05-177
29-4 6AP cell bypass valve	POEF-38-344-05-177
29-4 2AP cell bypass valve	POEF-38-344-05-177