Date Received by IRA
6-26-96

INFORMATION RELEASE REQUEST - (Long Form)

(GRAY SHADED AREAS NOT TO BE FILLED IN BY INITIATOR)

1. COMPLETE THIS SECTION FOR ALL DOCUMENTS

A. Information Category

Speech or Presentation
- [X] Full Paper
- [ ] Summary
- [ ] Abstract
- [ ] Visual Aid
- [ ] Journal Article
- [ ] Multimedia Presentation
- [ ] Software
- [ ] Other ______

B. Document ID Number (include rev., vol., etc.)
WHC-SA-3113-FP

C. List attachments (i.e., copyright permission, copyright transfer)

D. Document Title
Pollution Prevention Opportunity Assessments at Hanford

E. WHC Project or Program
Pollution Prevention

F. New or novel (patentable) subject matter? [n] No or Yes
If "Yes", has disclosure been submitted by WHC? [ ] No or Yes If "Yes", Disclosure No(s): ______

G. Information received from others in confidence, such as proprietary data, and/or inventions? [N] No or Yes If "Yes", contact WHC General Counsel.

H. Copyrights? [N] No or Yes If "Yes", attach permission.

I. Trademarks? [N] No or Yes If "Yes", identify in document.

2. COMPLETE THIS SECTION FOR ALL DOCUMENTS REQUIRING SUBMISSION TO OSTI

A. Unclassified Category UC -

B. Budget & Reporting Code B&R - EW3110022

3. COMPLETE THIS SECTION ONLY FOR A JOURNAL SUBMISSION

A. Title of Journal

4. COMPLETE THIS SECTION ONLY FOR A SPEECH OR PRESENTATION

A. Title for Conference or Meeting
DOE Pollution Prevention Conference XII

B. Group or Society Sponsoring
U.S. Department of Energy

C. Date(s) of Conference or Meeting
July 8-12

D. City/State
Chicago, IL

E. Will material be published in proceedings? [Y] No or Yes
Will material be handed out? [Y] No or Yes

5. REVIEWS

Signature indicates Approval as Requested unless otherwise indicated

Reviewers	Yes	Name (print)	Signature/Date	Limited-Use Info.
General Counsel	✓	C. Willingham	Chris Willingham 6-26-96	[ ]
DOE-RL	✓	Ellen B. Dagan	Ellen B. Dagan 6/25/96	[ ]
Communications	[ ]			[ ]
Applied Technology-Export Controlled Information or International Program	[ ]			[ ]
Other	[ ]			[ ]
Other	[ ]			[ ]

6. Applied Technology Material Referenced
[X] No [ ] Yes

7. Release Level
[X] Public [ ] Limited Distribution

8. Author/Requestor
M.D. Betsch 6/25/96
M. D. Betsch
(Print and Sign) Date

9. Responsible Manager
J. S. Merry 6/25/96
J. R. Kirkendall
(Print and Sign) Date

INFORMATION RELEASE ADMINISTRATION APPROVAL

IRA Approval is required before release. Release is contingent upon resolution of mandatory comments. NOTE: This block for IRA use only.

APPROVED FOR RELEASE
OFFICIAL DOCUMENT
CW
Date 6-26-96

Date Cancelled

Date Disapproved

A-6001-401 (07/94)

WHC-SA-3113-FP

Document ID Number

10. LEGENDS/NOTICES/MARKINGS (Required by WHC-CM-3-4 or Reviewer). Reviewer indicates applicable markings to be affixed or removed.

	Affix	Remove	Initials		Affix	Remove	Initials
Applied Technology	☐	☐		Official Use Only	☐	☐	
Availability - OSTI	☐	☐		Patent Status	☐	☐	
Availability - ESTSC	☐	☐		Predecisional Information	☐	☐	
Availability - NTIS	☐	☐		Programmatic Notice	☐	☐	
Business-Sensitive Information	☐	☐		Proprietary Information	☐	☐	
Computer Software Notice	☐	☐		Purpose and Use	☐	☐	
Copyright License Notice	☑	☐	CW	Thesis/Dissertation	☐	☐	
Export Controlled Information	☐	☐		Trademark Disclaimer	☐	☐	
Legal Disclaimer	☑	☐	CW	Other:	☐	☐	
Limited Disclosure	☐	☐					

11. MANDATORY COMMENTS (List only mandatory comments here. All other comments shall be made on the document and returned to the author.)	Reviewer (Print & Sign)	Date	Resolved by Author/Requestor (Print & Sign)	Date

12. ADDITIONAL INFORMATION/COMMENTS:

List of attachments: Pollution Prevention Opportunity Assessment dated 3-6-96, 6-7-95, 4-17-95 (worksheets) and 3-6-95, WHC-SD-WM-ES-358

WHC-SA-3113-FP

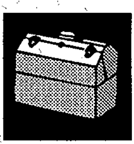
Pollution Prevention Opportunity Assessments at Hanford

FACTSHEET

DOE Pollution Prevention Conference XII

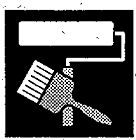
Abstract: The Pollution Prevention Opportunity Assessment (PPOA) is a pro-active way to look at a waste generating activity and identify opportunities to minimize waste through a cost benefit analysis. Hanford's PPOA process is based upon the graded approach developed by the Kansas City Plant. Hanford further streamlined the process while building in more flexibility for the individual users. One of the most challenging aspects for implementing the PPOA process at Hanford is our overall mission which is environmental restoration. Now that the facilities are no longer in production, each has a different non-routine activity making it difficult to quantify the inputs and outputs of the activity under consideration.

Hanford's Pollution Prevention Opportunity Assessment Tools



Hanford-Specific Training Workshop

One unique feature of the workshop is that participants conduct an assessment on an actual waste stream and activity of their choice. Prior to the workshop, the PPOA team conducts a facility walk-through to identify the inputs and outputs of the activity under consideration. Two of the four hours are dedicated to working through the assessment.



PPOA Worksheets

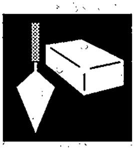
Each of the seven worksheets are obtained through a WordPerfect® macro. Each worksheet contains guidance to assist in conducting the assessment.

Two Worksheets are Completed Annually

- Waste Stream Information
- Priority Streams and Activities

Five Worksheets are Completed for Each PPOA

- Team and Activity Description
- Activity Flow Diagram
- Opportunity Description
- Opportunities Summary
- Recommendation and Schedule



Database Tracking System

Completed assessments are posted on the Hanford Pollution Prevention Homepage for tracking and search capabilities.

Internal Address:

http://wwwproxy.rl.gov:1050/whc/pp/wmin.htm

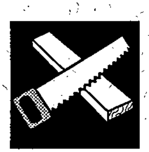
External Address:

http://www.hanford.gov/whc/pp/wmin.htm

Guidance Document

A guidance document serves to compliment the Hanford-specific PPOA training workshop. The guidance suggests:

- How to choose an activity
- How to conduct a PPOA
- How to get results
- How to show progress



Facility Technical Assistance

Pollution Prevention staff are assigned to over 20 waste generating facilities with the principle objective to assist in minimizing waste through the PPOA process as a team member and subject matter expert.

Hanford's Pollution Prevention Opportunity Assessment Approach

Facility Specific Assessments

During the annual goal-setting process, individual facilities identify the number of PPOAs anticipated for completion. The pollution prevention representative from each facility is responsible for identifying the waste stream and activity, and completing the PPOA with a team of individuals from the facility.

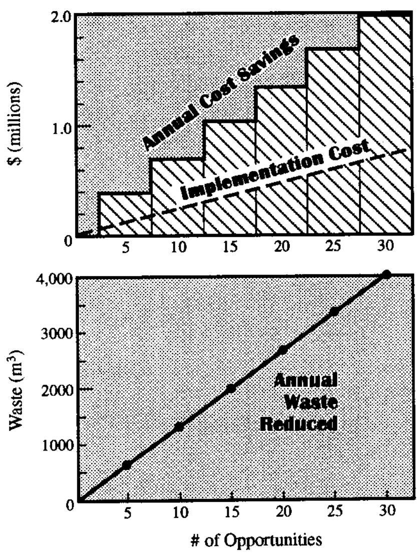
Sitewide Strategic Assessments

Sitewide crosscutting PPOAs were conducted to reduce the largest waste generating sources common to most contractors. A waste stream evaluation identified over 20 potential activities for sitewide consideration. In fiscal year 1995-96, eleven sitewide PPOAs were conducted.

Community Assessments

The U.S. Department of Energy, City of Richland, Westinghouse Hanford Company, and Washington State University at Tri-Cities have partnered to sponsor no-cost Pollution Prevention Assessments for small businesses.

Pollution Prevention Opportunity Assessment Accomplishments



- Over 115 assessments have been completed at Hanford from 1994 - 1996
- Implemented 30 Pollution Prevention Opportunities over the last year, funded primarily by EM-77
  - Average Cost Savings per PPOA: $103,800/year
  - Average Implementation Cost per PPOA: $15,000
  - Average Payback per PPOA: Less than 1 year

For more information:

Mary Betsch
Westinghouse Hanford Company Pollution Prevention
P.O. Box 1970, B3-28, Richland, WA 99352
Phone: (509) 372-1627
Fax: (509) 376-5560
EMail: Mary_D_Betsch@rl.gov

Pollution Prevention Opportunity Assessments at Hanford

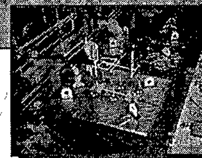
- **Project C-018 Ammonium Sulfate Reuse**
  - **Challenge:** Start-up testing of the 200 Area Effluent Treatment Facility was projected to generate 130 drums of processed ammonium sulfate.
  - **Opportunity:** Local farmers reused the processed ammonium sulfate as fertilizer.
  - **Dollars Saved:** $67,400
  - **Waste Reduced:** 8,580 kgs
  - **Implementation:** $1,180

- **Quantitative Extraction of Organic Chemicals from Solid Matrices**
  - **Challenge:** Soxhlet extraction is used for extracting the organic component from samples. This process generates hazardous waste solvents.
  - **Opportunity:** Implemented the Supercritical Fluid Extraction process. This process uses a smaller sample size and eliminates hazardous waste generation.
  - **Dollars Saved:** $290,229/year
  - **Waste Reduced:** 145 kgs/year and 1,824 kWh/year
  - **Implementation:** $22,555

Facility Specific Assessments

- **Compactible Waste**
  - **Challenge:** Inside a zone, paper is used for writing notes. The paper was either disposed of as low level waste or surveyed for release.
  - **Opportunity:** Purchased erasable wipe boards to write notes. The information is then transferred outside the zone electronically or by phone.
  - **Dollars Saved:** Minimum
  - **Waste Reduced:** Minimum
  - **Implementation:** $700

- **Handling Core Drilling Wastes**
  - **Challenge:** Drill strings were used once and disposed of as mixed waste.
  - **Opportunity:** Decontaminated drill strings for reuse.
  - **Dollars Saved:** $319,000/year
  - **Waste Reduced:** 12.5 m^3/year
  - **Implementation:** $256,670



- **K-Basin Water Treatment System**
  - **Challenge:** Fuel rods are stored at the K Basin. The K Basin water treatment system filters the basin water using mixed-bed Ion Exchange Modules (IXM).
  - **Opportunity:** Implemented two IXMs operating in parallel to double the life of the IXM unit. The first IXM has a resin ratio of 1:1 and the second has a strong-base anion resin.
  - **Dollars Saved:** $325,335/year
  - **Waste Reduced:** 54 m^3/year
  - **Implementation:** Negligible (utilized existing units)

Sitewide Strategic Assessments

- **Deactivation and Decontamination**
  - **Challenge:** Maintenance, surveillance, decontamination, housekeeping and deactivation activities generate wastes in radiological areas.
  - **Opportunity:** Hosted a Pollution Prevention Nuclear Power Operator Workshop to provide hands-on solutions to waste generating activities specific to Operators.
  - **Dollars Saved:** $121,180/year
  - **Waste Reduced:** 29 m^3/year and 121 kgs/year
  - **Implementation:** $15,000

Community Assessments

The U.S. Department of Energy, The City of Richland, Westinghouse Hanford Company, and Washington State University have partnered to offer no-cost pollution prevention assessments for small businesses.

- **Two Pilot Assessments Summer 1996**
  - Industrial Laundry Business
  - Automotive and Tire Business
- **Six Formal Assessments Fiscal Year 1997**

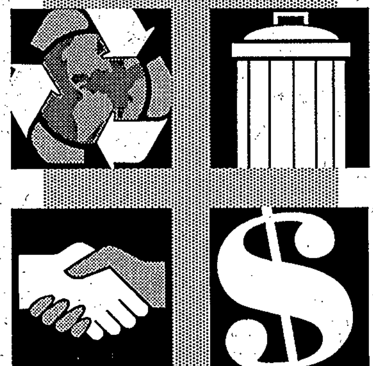
WHC-SA-3113-FP

Prepared for
U.S. Department of Energy
Pollution Prevention Conference XII
July 1996

POLLUTION PREVENTION
OPPORTUNITY ASSESSMENT

WHC-SA-3113-FP

Quantitative Extraction of Organic Chemicals from Solid Matrices



HANFORD SITE
August1995

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 1

Team and Activity Description

Date 8/1/95 **P2OA ID Code** PNL 95-03 **Facility** 3720, ESB
Activity Quantitative Extraction of Organic Chemicals from Solid Matrices

Team Members (*Leader)	Telephone	MSIN
Mike Hogan*, Environmental Technologies Division (Process Technologies Department)	372-2526	P8-38
Barbara Minton, Environment, Safety and Health Division (Environmental Compliance Department)	376-8662	P7-79
Robert Nielson, Environment, Safety and Health Division (Environmental Compliance Department)	373-9833	P7-79
Eric V. Alderson (no longer with PNL)	NA	NA

Description of Activity to be Examined in this P2OA

Characterization of organic chemicals in solid matrices first involves the extraction of the organic component. Currently, Soxhlet extraction is the standard process for extracting the organic chemicals from solid waste and environmental samples. The technology is time-consuming, requires long periods of energy usage (use of a heating mantle or hot plate for 18-24 hrs) and generates large volumes of hazardous wastes in the form of used solvents. A practical way of reducing or eliminating the waste stream as well as reducing energy usage was sought in the performance of this Pollution Prevention Opportunity Assessment. Since the other analytical facilities at Hanford use the Soxhlet Extraction Process, the findings of this assessment can be adapted for usage at other Hanford facilities. Additional cost savings could be realized by reducing mixed waste generated through the extraction of organic chemicals from radioactive environmental samples.

Note: In the specific situation examined, hexane, with a specific gravity of 0.659, was the representative solvent.

WHC-SA-3113-FP

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 2
Activity Flow Diagram

Date 8/1/95 **P2OA ID Code** PNL-95-03 **Facility** 3720, ESB
Activity Quantitative Extraction of Organic Chemicals from Solid Matrices

Chemical and Radioactive Inputs

Name	Quantity
Hexane (l)	126.5 kg

Material Inputs

Name	Quantity
Disposible Equipment (s)	1.0 kg
Sample Matrix (s)	28.8 kg

Energy Inputs

Name	Quantity
Electricity	1920 kWh

Activity
Activity Time Period:
1 year

Outputs include:
Solid (s)
Liquid (l)
Air (a)

Product or Result Output

Name	Quantity

Hazardous Waste Output

Name	Quantity
Hexane (l)	126.5 kg
Contaminated Equipment (s)	1.0 kg
Sample Matrix (s)	28.8 kg

Non-Hazardous Waste Output

Name	Quantity
none	

Radioactive Waste Output

Name	Quantity

Mixed Waste Output

Name	Quantity

Other

Name	Quantity

Total Input mass ≈ Total Output mass
156.3 kg In ≈ 156.3 kg Out

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 3A
Pollution Prevention Opportunity Description

Date 8/1/95 **P2OA ID Code** PNL-95-03 **Facility** 3720, ESB
Activity Quantitative Extraction of Organic Chemicals from Solid Matrices
P2O No. PNL-95-03-1 **P2O Title** Supercritical Fluid Extraction

Current Practice

Characterization of organic chemicals in solid matrices first involves the extraction of the organic component. Currently, Soxhlet extraction is the primary process for extracting the organic chemicals from solid waste and environmental samples. The technology is time-consuming, requires long periods of energy usage and generates large volumes of hazardous wastes in the form of solvents.

Recommended Action

It is recommended that the supercritical fluid extraction (SFE) process be used in place of the Soxhlet extraction process. The Soxhlet extraction process uses 200 - 500 ml of solvents per sample and requires the use of extraction thimbles. The SFE process uses 10 ml per sample and does not require extraction thimbles*, which cost $3.00 each. When used, the extraction thimbles must be disposed of as hazard waste. The SFE process uses less energy, requires less analyst time, and generates less regulated hazardous waste. Furthermore, the SFE process has been approved by regulatory agencies as a reliable substitution for the Soxhlet process.

Liquid, SFE-grade CO_2 is pressurized between 4,000 and 10,000 psi and pumped through a heated cell containing up to 10 ml of sample. The pressurized CO_2 extracts the analyte and then passes through a solvent-filled collection vial, which captures the analyte. The CO_2 is then vented through a laboratory hood.

*In special cases, disposable extraction cells might be required in the SFE process. For example, if you have problems cleaning the extraction cells from run to run, you can purchase disposable ones. Generally the process of cleaning the cell each time would generate more hazardous waste than if you merely had a disposable cell for each run. This would be especially true of analyses involving things like PCBs, Polycyclic Aromatics, etc. For most runs however, a stainless steel extraction vessel or a high density plastic digestion vessel which could be reused would be sufficient.

Calculation of Waste Reduction and/or Energy Savings

Note: Calculations based on Hexane, with a specific gravity of 0.659kg/L and an average of 80 runs per month.

Soxhlet Process:
(0.2 L of Solvent used/run) (80 runs/month)(12 months/year) = 192 L Solvent used/year
(1 extraction thimble used/run) (80 runs/month)(12 months/year) = 960 extraction thimbles/year
(960 extraction thimbles)(0.001kg/extraction thimble) = 0.96kg of hazardous waste/year
(0.03kg of matrix/run) (80 runs/month)(12 months/year) = 28.8 kg of hazardous waste/year
(2 kWh/run) (80 runs/month)(12 months/year) = 1920 kWh
(4 hrs Labor/run) (80 runs/month)(12 months/year) = 3840 hrs

WORKSHEET 3A (cont'd)

Pollution Prevention Opportunity Description

SFE Process:

(0.01 L of Solvent used/run) (80 runs/month)(12 months/year) = 9.6 L Solvent used/year
(0.005kg of matrix/run) (80 runs/month)(12 months/year) = 4.8 kg of hazardous waste/year
(0.1 kWh/run) (80 runs/month)(12 months/year) = 96 kWh
(0.5 hrs Labor/run) (80 runs/month)(12 months/year) = 480 hrs

Comparison of Processes:

(192 L - 9.6 L) (0.659kg/L) = 120.2 kg less solvent purchased per year
(192 L - 9.6 L) (0.659kg/L) = 120.2 kg less solvent disposed of as hazardous waste per year
960 extraction thimbles not purchased per year
0.96 kg of contaminated extraction thimbles not disposed of per year
(28.8 kg - 4.8 kg) = 24.0 kg of contaminated sample matrix not disposed of per year
1920 kWh - 96 kWh = 1824 kWh saved per year
3840 hrs - 480 hrs = 3360 hours of labor saved per year

Calculation of Annual Cost Savings

(120.2 kg) ($15/kg) = $1,803 saved in solvent purchases
(960)($3.00) = $2880 saved in extraction thimble purchases
(120.2 kg + 0.96 kg + 24.0 kg) ($115/kg) = $16,693 saved in hazardous waste management & disposal charges (1824 kWh) ($0.029/kWh) = $53 saved in energy cost
(3360 hrs Labor)($80/hrs) = $268,800 saved in labor cost
= $290,229/year

Calculation of Implementation Cost and Payback

Description	Cost (GSA)
ISCO Model 100DX Pump & Controller w/cooling jacket	$9,272
Refill Valve Kit	$ 247
Outlet Valve Kit	$ 247
CO_2 Connection Pkg.	$ 24
SFX 2-10 Extractor w/ 10-ml cartridges	$5,605
SF Solver Software Pkg.	N/C
Model 100DX Spare Parts Pkg.	$1,185
SFX 2-10 Spare Parts Pkg.	$ 775
Coaxially Heated Restrictor	$3,200
On-site Installation and Training	$2,000

TOTAL IMPLEMENTATION COST $22,555

Payback Period = $22,555/($290,229/year) = 0.08 years or approximately 1 month

WORKSHEET 3B

Pollution Prevention Opportunity Description

Date 8/1/95 **P2OA ID Code** PNL-95-03 **Facility** 3720, ESB
Activity Activity Quantitative Extraction of Organic Chemicals from Solid Matrices
P2O No. PNL-95-03-2 **P2O Title** Microwave-Assisted Extraction Process

Current Practice

Characterization of organic chemicals in solid matrices first involves the extraction of the organic component. Currently, Soxhlet extraction is the primary process for extracting organic chemicals from solid waste and environmental samples. The technology is time-consuming, requires long periods of energy usage and generates large volumes of hazardous wastes in the form of solvents.

Recommended Action

It is recommended that the Microwave-Assisted Extraction Process (MAEP) be used in place of the Soxhlet extraction process. The Soxhlet extraction process uses 200 - 500 ml of solvents per sample and requires the use of extraction thimbles. The MAEP uses 30 ml per sample and does not require extraction thimbles*, which cost $3.00 each. The extraction thimbles, when contaminated, must be disposed of as hazard waste. The MAEP uses less energy, requires less analyst time, and generates less regulated hazardous waste. Furthermore, MAEP has been approved by regulatory agencies as a reliable substitution for the Soxhlet process

*In special cases, disposable extraction cells might be required with the MAEP. For example, if you have problems cleaning the extraction cells from run to run, you can purchase disposable ones. Generally the process of cleaning the cell each time would generate more hazardous waste than if you merely had a disposable cell for each run. This would be especially true of analyses involving things like PCBs, Polycyclic Aromatics, etc. For most runs however, a stainless steel extraction vessel or a high density plastic digestion vessel which could be reused would be sufficient.

Calculation of Waste Reduction and/or Energy Savings

Note: Calculations based on Hexane, with a specific gravity of 0.659kg/L and an average of 80 runs per month.

Soxhlet Process:

(0.2 L of Solvent used/run) (80 runs/month)(12 months/year) = 192 L Solvent used/year
(1 extraction thimble used/run) (80 runs/month)(12 months/year) = 960 extraction thimbles/year
(960 extraction thimbles)(0.001kg/extraction thimble) = 0.96kg of hazardous waste/year
(0.03kg of matrix/run) (80 runs/month)(12 months/year) = 28.8 kg of hazardous waste/year
(2 kWh/run) (80 runs/month)(12 months/year) = 1920 kWh
(4 hrs Labor/run) (80 runs/month)(12 months/year) = 3840 hrs

MAEP:

(0.03 L of Solvent used/run) (80 runs/month)(12 months/year) = 28.8 L Solvent used/year
(0.005kg of matrix/run) (80 runs/month)(12 months/year) = 4.8 kg of hazardous waste/year
(0.2 kWh/run) (80 runs/month)(12 months/year) = 192 kWh
(0.17 hrs Labor/run) (80 runs/month) (12 months/year) = 163.2hrs

WORKSHEET 3B (cont'd)

Pollution Prevention Opportunity Description

Comparison of Processes

(192 L - 28.8 L) (0.659kg/L) = 107.5 kg less solvent purchased per year
(192 L - 28.8 L) (0.659kg/L) = 107.5 kg less solvent disposed of as hazardous waste per year
960 extraction thimbles not purchased per year
0.96 kg of contaminated extraction thimbles not disposed of per year
(28.8 kg - 4.8 kg) = 24.0 kg of contaminated sample matrix not disposed of per year
1920 kWh - 192 kWh = 1728 kWh saved per year
3840 hrs - 163.2 hrs = 3676.8 hours of labor saved per year

Calculation of Annual Cost Savings

(107.5 kg) ($15/kg) = $1613 saved in solvent purchases
(960)($3.00) = $2880 saved in extraction thimble purchases
(107.5 kg + 0.96 kg + 24.0 kg) ($115/kg) = $15,232 saved in hazardous waste management & disposal charges
(1728 kWh) ($0.029/kWh) = $50 saved in energy cost
(3676.8 hrs Labor)($80/hrs) = $294,144 saved in labor cost
= $313,919/year

Calculation of Implementation Cost and Payback

Description	Price
MSP-1000 Microwave Sample Preparation System	$25, 950
Installation of system	$ 550
TOTAL IMPLEMENTATION COST	$26,500

Payback Period = $26,500/($313,919) = 0.08 years or approximately 1 month

WHC-SA-3113-FP

WORKSHEET 4

Pollution Prevention Opportunities Summary

ate 8/1/95 **P2OA ID Code** PNL-95-03 **Facility** 3720, ESB
Activity Quantitative Extraction of Organic Chemicals from Solid Matrices

P2O No.	P2O Title	Waste Class Reduced	Annual Waste Reduction or Energy Savings	Estimated Annual Savings*	Estimated Implementation Cost	Payback (years)
1	Super-critical Fluid Extraction	HW HW	145.2 kg waste 1824 kWh energy	$290,229	$22,555	0.08
2	Microwave-Assisted Extraction Process	HW HW	132.5 kg waste 1728 kWh energy	$313,919	$26,500	0.08

Notes and Other Benefits

Other analytical facilities at Hanford besides the ones investigated in this opportunity assessment use the Soxhlet Extraction Process. Consequently the findings of this assessment could be adapted for more widespread usage at Hanford for more cost savings. Additional cost savings could be realized by reducing mixed waste generated through the extraction of organic chemicals from radioactive environmental samples. Mixed waste disposal costs exceed those of hazardous waste.

* Estimated Annual Savings include cost savings achieved through reduced purchases of chemicals and disposable laboratory equipment.

WHC-SA-3113-FP

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 5

Final Summary

Date 8/1/95 **P2OA ID Code** PNL-95-03 **Facility** 3720, ESB

Activity Quantitative Extraction of Organic Chemicals from Solid Matrices

Proposed Opportunities and Discussion

It was decided to implement both opportunities that were investigated. The implementation costs were relatively small compared to the benefits of the annual cost savings. Both opportunities had a payback period of approximately one month. Also, the two procedures have selective efficiency for different matrices. To have the capability of selectively implementing either method would increase the efficiency of the extraction process and subsequently the accuracy of the analysis.

Recommendations and Schedule for Implementation

The Supercritical Fluid Extraction opportunity #PNL-95-03-1 has been implemented under the Pilot Microscale Chemistry Implementation Project #22363. Equipment will be procured and installed in September, 1995, and expense funding allocated for installation and start up.

The Microwave-Assisted Extraction Process opportunity #PNL-95-03-2 has been implemented under the Environmental Sustainability Project #19172. Equipment will be procured and installed in September, 1995, and expense funding allocated for installation and start up.

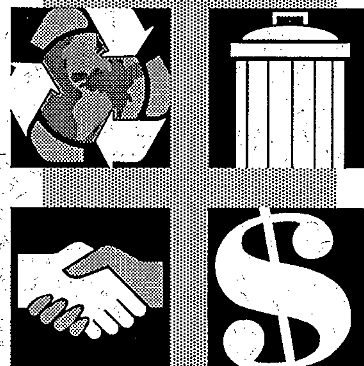
WHC-SA-3113-FP

Prepared for
U.S. Department of Energy
Pollution Prevention Conference XII
July 1996

POLLUTION PREVENTION
OPPORTUNITY ASSESSMENT

WHC-SA-3113-FP

K-Basin Water Treatment System



HANFORD SITE
March 1996

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 1

Team and Activity Description

Date 3/06/96 **P2OA ID Code** Site_7 **Facility** Sitewide

Activity K Basin Water Treatment System

Team Members (*Leader)	Telephone	MSIN
Noel Hinojosa	373-6874	X3-67
Rod Jochen	373-4246	X3-67
Tom Pauly	373-2438	X3-85
Dean Humphrys	373-3143	X3-67
Chris Lucas	373-1006	X3-67
Mitch Vitulli	373-1555	X3-70
Carol Pitkoff	376-7188	R3-48
Steve Burke	373-1973	X3-74
Dick Uhlrich*	376-3580	B3-28

Description of Activity to be Examined in this P2OA

Background

Following an analysis of K Basin waste streams and a tour of the K Basin waste generating activities, the K Basin Water Treatment System was selected as the waste stream with the greatest potential for improvement. A P2OA team was then formed to brainstorm improvements to that system.

The K Basin Water Treatment System currently filters the basin water using Ion Exchange Modules (IXM) and cartridge and/or sand filters upstream from the IXM units. The IXM units were first installed in the KE and KW basins in 1986. Since then several different types of filter systems have been used upstream from the IXM units including a sand filtration system that could be back-washed. Now the current system has two sets of cartridge filters (a running and standby set) in a filter housing. A set contains seven filters and are placed in a cylindrical cask for long-term storage on a mixed waste pad at the Central Waste Complex (200 West) when removed. Most IXM units are disposed as LLW at a 200W burial site. However on rare occasions these units have become TRU waste. The spent filters are TRU waste.

In the brainstorm session, the team learned that the closed loop water treatment system is in a conceptual design upgrade phase needed to cope with the four year fuel and sludge removal stage which is scheduled to start in 12/97. Since the IXMs are not planned to be re-designed in the upgrade, the team decided to focus on the LLW and the IXMs excluding the TRU filters.

LLW and IXMs

The IXMs are self-shielding single use disposable water treatment units used for the removal of radionuclides from the water of the 105K building fuel storage basins. They are self contained units which consist of six carbon steel tanks connected to a common inlet and outlet, and encased within a block of concrete which serves as shielding for internal radiation which emanates from the radionuclides trapped inside. Each IXM has a volume of 7.25 cubic meters, and weighs 42,000 pounds which requires a rigging crew and equipment each time the unit is moved. On the average, an IXM must be moved four times (to the 100K area, into the basin, from the basin to temporary storage, and then to the 200W burial site). The IXMs have been certified as a High Integrity Container, and therefore serve as their own burial container. The basins south loadout pits can hold a maximum of two units, however now only one unit is in service with the second unit on standby. Initially resins were added to the IXMs by the manufacturer before shipment. Twelve of these loaded units are still in inventory. Now resins are added just before the IXM is installed in the basin, and ten of these no resin units are in inventory.

Since 1986, the units were replaced on the average every 60 days in KE and every nine months in KW. However in FY 1995, 18.5 units were used in KE because of various problems with the basin water. The KE basin water problems have now been corrected, but due to increased basin activity the replacement average is still expected to average about 15 units per year (1/month in KE, and 3/year in KW).

WORKSHEET 2
Activity Flow Diagram

Date 3/06/96 P2OA ID Code Site_7 Facility Sitewide
Activity K Basin Water Treatment System

Chemical and Radioactive Inputs

Name	Quantity
none	

Material Inputs

Name	Quantity
IXM units	108.75 m^3
NUC-FIL 2 inch	1.50 kg
NUC-FIL 3/4 inch	1.00 kg
Plastic Sheeting	1.00 m^3

Energy Inputs

Name	Quantity
none	

Activity
Activity Time Period:
1 year

Product or Result Output

Name	Quantity
none	

Hazardous Waste Output

Name	Quantity
none	

Non-Hazardous Waste Output

Name	Quantity
none	

Radioactive Waste Output

Name	Quantity
IXM units	108.75 m^3
NUC-FIL 3/4 inch	1.00 kg
NUC-FIL 2 inch	1.50 kg
Plastic Sheeting	1.00 m^3

Mixed Waste Output

Name	Quantity
none	

Other

Name	Quantity
none	

Total Input mass ≈ Total Output mass 0.00 kg In ≈ 0.00 kg Out

Comments:

WORKSHEET 3A
Pollution Prevention Opportunity Description

Date 3/6/96 P2OA ID Code Site_7 Facility Sitewide
Activity K Basin Water Treatment System
P2O No. 1 P2O Title Single IXM with Different Resin Ratio

Current Practice

The current KE and KW basin configurations have two IXMs in the basin; a single IXM in service with a mixed-bed resin in a 1:1 ratio, and a standby unit. In inventory there are twelve IXMs loaded with resins in a 1:1 ratio, and ten units without resin loaded.

Recommended Action

Modify the single in service IXM with different anion to cation ratio of 2:1 in order to eliminate premature anion depletion. This mode of operation would not begin until inventory of resin pre-loaded IXMs is consumed, which is estimated to take a year.

Calculation of Waste Reduction and/or Energy Savings

Fifteen IXM units are used annually with a volume of 7.25 each. (15 x 7.25 = 108.75).
The 2:1 ratio eliminates half of the IXMs. (108.75 divided by 2 = 54.38 cubic meters).

Calculation of Annual Cost Savings

The IXM unit life cycle cost is based on the vendor cost ($25,202), with 3.2% MPR and 13.5% G&A applied ($4,317), the NUC-FIL filters and miscellaneous components for preparing the spent units for burial ($649), the IXM movement costs ($1,610), and solid waste management costs for LLW untreated waste (7.25 cubic meters x $1,600/cubic meter = $11,600). Therefore the total life cycle cost is $43,378 per unit. For 15 units the annual cost is $650,670.

Based on process knowledge, the use of a different resin mix ratio is estimated to improve the life of the IXM units by 50% (from 30 to 60 days in KE and 120 to 240 days in KW). Annual savings would be 7.5 units or $325,335.

The total annual cost savings is $325,335.

This P2OA will be reviewed one year after the new resin composition has been introduced to validate the estimated savings.

Annual cost savings is $325,335.00

Calculation of Implementation Cost and Payback

The implementation costs include the cost of the anion resin (1/3 of the mix) are offset by the reduced amount of the mixed resin (2/3 of the mix). No addition labor costs are anticipated.

The payback of 7.5 units or $325,335 will be achieved immediately after the current resin loaded units have been used.

Total Implementation Cost: $0.00

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 3B

Pollution Prevention Opportunity Description

Date 3/6/96 **P2OA ID Code** Site_7 **Facility** Sitewide
Activity K Basin Water Treatment System
P2O No. 2 **P2O Title** Two IXM Units Operating in Parallel

Current Practice

The current KE and KW basin configurations have two IXMs in the basin; a single IXM in service with a mixed-bed resin in a 1:1 ratio, and standby unit. In inventory there are twelve IXMs loaded with resins in a 1:1 ratio, and ten units without resin loaded.

Recommended Action

Two IXMs operating in parallel. The first IXM would be an existing IXM pre-loaded with mixed-bed resin in 1:1 ratio. The second IXM would be loaded with strong-base anion resin only. This mode of operation could begin immediately. The basins south loadout pits can hold two IXMs at one time. Since both IXM units will be in service in this mode of operation, there would not be a standby unit immediately available. If the lack of a backup unit is a concern, the concern could be resolved by an immediate implementation of P2O No. 3, using a previously loaded unit. Two of the carbon tanks would need to have the mixed bed resin removed and replaced with the anion resin. The labor cost for this is estimated at about 12 hours or about $550 per IXM.

Calculation of Waste Reduction and/or Energy Savings

Fifteen IXM units are used annually with a volume of 7.25 each. (15 x 7.25 = 108.75).
The 2:1 ratio eliminates half of the IXMs. (108.75 divided by 2 = 54.38 cubic meters).

Calculation of Annual Cost Savings

The IXM unit life cycle cost is based on the vendor cost ($25,202), with 3.2% MPR and 13.5% G&A applied ($4,317), the NUC-FIL filters and miscellaneous components for preparing the spent units for burial ($649), the IXM movement costs ($1,610), and solid waste management costs for LLW untreated waste (7.25 cubic meters x $1,600/cubic meter = $11,600). Therefore the total life cycle cost is $43,378 per unit. For 15 units the annual cost is $650,670.

Based on process knowledge, the use of a different resin mix ratio is estimated to improve the life of the two IXM units working in parallel by 50% (from 60 to 120 days in KE and 240 to 480 days in KW). Annual savings would be 7.5 units or $325,335.

The total annual cost savings is $325,335.

This P2OA will be reviewed one year after the new resin composition has been introduced to validate the estimated savings.

Annual savings is $325,335.00

Calculation of Implementation Cost and Payback

The implementation costs include the cost of the anion resin and loading it into the second IXM. Loading of the new anion resin would be done the next time a spent IXM would be replaced. There are no addition costs for using and loading the anion resin.

The payback of 7.5 units or $325,335 will be achieved immediately after loading a second IXM with anion resin in the basin.

Total Implementation Cost: $0.0

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 3C

Pollution Prevention Opportunity Description

Date 3/6/96 **P2OA ID Code** Site_7 **Facility** Sitewide
Activity K Basin Water Treatment System
P2O No. 3 **P2O Title** Single IXM Loaded with a Combination Resin

Current Practice

The current KE and KW basin configurations have two IXMs in the basin; a single IXM in service with a mixed-bed resin in a 1:1 ratio, and a standby unit. In inventory there are twelve IXMs loaded with resins in a 1:1 ratio, and ten IXMs without resin loaded.

Recommended Action

Load four of the six carbon tanks within a single empty IXM with mixed-bed resin, and the remaining two tanks with anion only resin. This mode would only be considered after existing pre-loaded IXMs are consumed, which is estimated to take about a year.

Calculation of Waste Reduction and/or Energy Savings

Fifteen IXM units are used annually with a volume of 7.25 each. (15 x 7.25 =108.75).
The 2:1 ratio eliminates half of the IXMs. (108.75 divided by 2 = 54.38 cubic meters).

Calculation of Annual Cost Savings

The IXM unit life cycle cost is based on the vendor cost ($25,202), with 3.2% MPR and 13.5% G&A applied ($4,317), the NUC-FIL filters and miscellaneous components for preparing the spent units for burial ($649), the IXM movement costs ($1,610), and solid waste management costs for LLW untreated waste (7.25 cubic meters x $1,600/cubic meter = $11,600). Therefore the total life cycle cost is $43,378 per unit. For 15 units the annual cost is $650,670.

Based on process knowledge, the use of a different resin mix ratio is estimated to improve the life of the IXM units by 50% (from 30 to 60 days in KE and 120 to 240 days in KW). Annual savings would be 7.5 units or $325,335.

This P2OA will be reviewed one year after the new resin composition has been introduced to validate the estimated savings

Annual savings is $325,335.00

Calculation of Implementation Cost and Payback

The implementation costs include the cost of the anion resin (1/3 of the mix) which are offset by the reduced amount of the mixed resin (2/3 of the mix). No additional labor costs are anticipated.

The payback of 7.5 units or $325,335 will be achieved immediately after the current resin loaded units have been used.

Total implementation cost: $0.00

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 4

Pollution Prevention Opportunities Summary

Date 3/6/96 **P2OA ID Code** Site_7 **Facility** Sitewide
Activity K Basin Water Treatment System

P2O No.	P2O Title	Waste Class Reduced	Annual Waste Reduction or Energy Savings	Estimated Annual Savings	Estimated Implementation Cost	Payback (years)
1	Single IXM with Different Resin Ratio	LLW	54.38 m^3	$325,335	$0.00	0.00
2	Two IXM Units Operating in Parallel	LLW	54.38 m^3	$325,335	$0.00	0.00
3	Single IXM Loaded with a Combination	LLW	54.38 m^3	$325,335	$0.00	0.00

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 5

Final Summary

Date 3/6/96. **P2OA ID Code** Site_7 **Facility** Sitewide
Activity K Basin Water Treatment System

Proposed Opportunities and Discussion

All three of the opportunities analyzed have a good return on investment. Use of the anion resin with a mixed bed resin is expected to improve the life of the IXMs. However configuration P2O #2 (loading the anion resin in a new IXM) provides an immediate payout. While similar paybacks are expected in P2O #1 and P2O #3, both of these configurations require the depletion of the resin loaded IXMs first. Since there are 12 mixed-bed resin loaded IXMs in inventory, it is expected to take nearly a year to consume these units.

Recommendations and Schedule for Implementation

Opportunity #2 is recommended--Load a new IXM (non-resin loaded) with anion resin and place it in the basin as a second IXM. This activity should continue until the current inventory of mixed-bed resin units are depleted. At that time, either of the three different configurations are viable and provide the same payback.

It is further recommended that the K Basin Water Treatment System be reviewed again when the design of the system upgrade is completed.

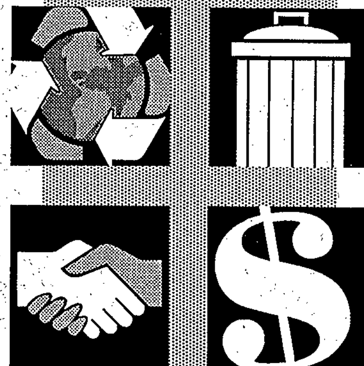
WHC-SA-3113-FP

Prepared for
U.S. Department of Energy
Pollution Prevention Conference XII
July 1996

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WHC-SA-3113-FP

Deactivation and Decontamination



HANFORD SITE
June 1995

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 1
Team and Activity Description

Date 6/07/95 **P2OA ID Code** **Facility** Trans. Proj.

Activity Deactivation, Decontamination and Zone Reduction

Team Members (*Leader)	Telephone	MSIN
L J Estey*	373-3387	R3-56
Barb Woodford	373-2388	T5-04
Carl Barr	373-1868	T5-54
Gaye Peale	373-2432	T6-20
Wayne Buzhardt	373-2473	T6-20
Shaun Waters	372-1471	S5-49
Linda Conlin	373-2435	T6-20
Cecilia O'Shaughnessey	372-2007	G6-60
Bob Moe	373-5229	S5-52
Jim Hilliard	373-1782	S5-75
Susan Bee	373-2435	T6-20
David Jackson	373-2435	T6-20
Ross Schultz	372-0133	S6-60
Bonnie Judy	372-0121	S6-62
Jeff Bramson	373-1359	T5-54
Mary Betsch	372-1627	B3-28
Tom Beam	372-0019	S4-66

Description of Activity to be Examined in this P2OA

As maintenance, surveillance, decontamination, housekeeping and deactivation activities are performed, wastes are generated in rdiological areas. This includes activities associated with zone reduction, contamination control, maintenance support, and deactivation facilities for transition to D&D.

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 3

Pollution Prevention Opportunity Description

Date 6/07/95 P2OA ID Code Facility Trans. Proj.

Activity Deactivation, Decontamination and Zone Reduction

Status of Accepted Opportunities Transition Projects, Hanford Site

Opportunity Assessment and P2 Database Number	Opportunity Description	Status	Comments
Deactivation and Deontamination TranP17-01	Tamper Indicating system for release and control of materials from radiological areas	AO	Idea needs approval from individual facility or site rad control organizations. Estimated savings: $65,350. Implementation Costs: $1,250 Waste Avoided: 11.5 m^3 LLW, 2.9 m^3 MW, 60 kgs HW. Payback: 0.019 years
Deactivation and Decontamination Tran17-02	Controlled Chemical and Material Inventories	FSI	Implemented at B Plant, PFP, FFTF, and PFP Estimated savings: $154,870 Implementation Cost: $113,520 Waste Avoided: 34.5 m^3 LLW, 5.8 m^3 MW, 607 kgs HW Payback: 0.73 yr

STATUS

AO - Assess Opportunity
DP - Develop Plan
PR - Project Result
AP - Assess Plan
IP - Inform Personnel
PI - Pilot Implementation
FSI - Full Scale Implementation
CD - Collect Data
ED - Evaluate Data
EHF - Evaluate Human Error
RR - Report Results
FR - Feedback/Recognition

OPPORTUNITIES INITIATED

PS - Product Substitution
CC - Configuration Control
R - Recycle
AC - Administrative Control
C - Compacting
ME - Material Evaluation
D - Deletion from Process
S - Segregation
T - Treatment
SS - Surplus Sales/Excess

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 3 (cont'd)

Pollution Prevention Opportunity Description

Status of Accepted Opportunities Transition Projects, Hanford Site

Opportunity Assessment and P2 Database Number	Opportunity Description	Status	Comments
Deactivation and Deontamination Tran17-03	Update technology of hand held survey instruments	AO	Current hand held survey instruments are not capable of detecting lower release levels required for free release by theRadiological Control Manual. No facility has led the process to select new technology or alternative survey units. Estimated Savings: $711,180 Implementation Cost: $100,000 Waste Avoided: 153 m^3 LLW, 29.2 m^3 MW, Payback: 0.1 years
Deactivation and Decontamination Tran17-04	Deactivation and decontamination nuclear operator workshop	DP	Workshop scheduled for December 6th and 7th, 1995. Funding for workshop received Estimated Savings: $121,180 Implementation Costs: $15,000 Waste Avoided: 23 m^3 LLW, 5.8 m3 MW, 121 kgs HW, Payback: 0.17 years
Deactivation and Decontamination Tran17-05	Eliminate Paper Disposal Personal Protective Clothing	DP	PFP and 222-S labs evaluating alternative laundry service for disposal coveralls. Estimated Savings: $394,720 Implementation Cost: $TBD Waste Avoided: 172.5 m^3 LLW, 7.4 m^3 TRU

WORKSHEET 3 (cont'd)

Pollution Prevention Opportunity Description

Status of Accepted Opportunities Transition Projects, Hanford Site

Opportunity Assessment and P2 Database Number	Opportunity Description	Status	Comments
Deactivation and Deontamination Tran17-06	Integrate P2 into Performance Based Initiatives	PP	PFP has developed pilot program for performance based measures on monthly basis. Estimated savings: $Unknown Implementation cost: TBD Waste Avoidance: TBD
Deactivation and Decontamination Tran17-07	Integrate P2 techniques and opportunities into planning and maintenance work packages	PP	PFP has implemented the use of P2OAs for each maintenance package or work plan as part of the planning process (6/95) Estimated Savings: $203,042 (TrP Wide) Implementation Costs: $30,000 Waste Avoidance: 23 m^3 LLW, 8.25 m^3 TRU, 5.8 m^3 MW, 124 kgs HW Payback: 0.15 years
Deactivation and Decontamination Tran17-08	Defrock HEPA Filters	FSI	PUREX has defrocked LLW filters, separating paper media from metal and wooden housings and compacting the paper media, when possible. PFP has also performed this on non-TRU waste filters. Estimated savings: $283,848 Implementation Cost: $10,000 Waste Avoidance: 28,68 m^3 LLW, 7.92 m^3 TRU, 10.95 m^3 MW Payback: 0.035 years

WHC-SA-3113-FP

WORKSHEET 3 (cont'd)

Pollution Prevention Opportunity Description

Status of Accepted Opportunities Transition Projects, Hanford Site

Opportunity Assessment and P2 Database Number	Opportunity Description	Status	Comments
Deactivation and Deontamination Tran17-09	Alternatives to Chemical Decontamination and sandblasting: CO_2 pelletization	PP	222-S, B-Plant have performed pilot tests using the CO_2 system to decon lead and other contaminated metal surfaces. A unit exists on site to be used in other areas. Estimated savings: $283,510 Implementation Cost: $250,000 Waste Avoidance: 19.1 m^3 LLW, 6.55 m^3 MW, 364 kgs HW Payback: 1 year
Deactivation and Decontamination Tran17-10	Alternatives to Chemical Decontamination and sandblasting: ARMEX System	PP	PFP has implemented the use of P2OAs for each maintenance package or work plan as part of the planning process (6/95) PUREX utilized the unit during a paint removal test on a non-contaminated surface. WHC regulatory analysis considered the materials (baking soda blast media) hazardous until an assay result from another company and an agreement on it's non regulatory status from WDOE was obtained. PFP, PUREX and Bechtel are considering it's use based upon the successful pilot. Estimated savings: $119,013 Implementation Costs: $21,500 Waste Avoidance: 11.47 m^3 LLW, 6.55 m^3 MW, 364 kgs HW Payback: 0.1 year

WHC-SA-3113-FP

WORKSHEET 3 (cont'd)
Pollution Prevention Opportunity Description

Status of Accepted Opportunities Transition Projects, Hanford Site

Opportunity Assessment and P2 Database Number	Opportunity Description	Status	Comments
Deactivation and Decontamination Tran17-11	Alternatives to Chemical Decontamination and Sandblasting: ESI non-regulated products	FSI	PFP has discontinued the use of acid, alkaline and solvent based detergents and degreasers during surface decon through the substitution of non-regulated products by Environmental Scientific Inc. (ESI-630, 645, 670, 675) Estimated savings: \$106,183 Implementation costs: \$1,150 Waste Avoidance: 7.5 m^3 TRU, 2.62 m^3 MW, 125 kgs HW Payback: 0.02 years
Deactivation and Decontamination Tran17-12	Reduce vegetation or reduce the need to handle tumbleweeds	A0	Each facility considering the cost of disposal of tumbleweeds based upon facility specific rad con procedures and policies. The best method would be a site wide developed and implemented plan, with improved control and prevention. Estimated Savings: \$136,593 Implementation Costs: \$15,000 Waste Avoidance: 172.5 m^3, LLW Payback: 0.078 years

WHC-SA-3113-FP

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 3 (cont'd)
Pollution Prevention Opportunity Description

Status of Accepted Opportunities Transition Projects, Hanford Site

Opportunity Assessment and P2 Database Number	Opportunity Description	Status	Comments
Deactivation and Decontamination Tran17-13	Alternatives to Chemical Decontamination and Sandblasting: Kelley Steam Cleaner	FSI	The Kelley system has been used in decon efforts at B Plant and PUREX, but not on a large scale. The unit will be presented at an upcoming workshop on P2 for operators on the site. Estimated Savings: \$327,750 Implementation Costs: \$15,000 Waste Avoidance: 4.5 m^3 TRU, 2.62 m^3 MW, 30.6 m^3 LLW Payback: 0.11 years
Deactivation and Decontamination Tran17-14	Reduce contaminated zones within facilities	FSI	Contamination Control Implementation Plans are being used within each facility, and are part of performance based initiatives on the site. The reduction of zones reduces the amount of waste considered LLW/LLWMW. Estimated Savings: >\$1.5 million Implementation Cost: \$250,000 Waste Avoidance: 68.85 m^3 Payback: 0.15 years

WHC-SA-3113-FP

WORKSHEET 3 (cont'd)

Pollution Prevention Opportunity Description

Status of Accepted Opportunities Transition Projects, Hanford Site

Opportunity Assessment and P2 Database Number	Opportunity Description	Status	Comments
Deactivation and Deontamination Tran17-15	Purchase bulk gloves in operation areas to reduce LLW cardboard and paper scrap wastes	PP	Bulk gloves have been ordered from a variety of vendors, and are being dispersed in right and left hand containers in change rooms. Estimated savings: $46,800 Implementation Cost: $1,500 Waste Avoidance: 11.47 m^3 LLW Payback: 0.1 years
Deactivation and Decontamination Tran17-16	Use strippable teflon liners on surfaces to assist in decontam-ination	FSI	PFP uses teflon on 227-T hood and process lab hood areas to reduce the amount of effort and materials required during decontamination. Estimated savings: $14,535 Implementation cost: $1,000 Waste Avoidance: 7.65 m^3 LLW Payback: 0.1 years

WHC-SA-3113-FP

Prepared for

U.S. Department of Energy

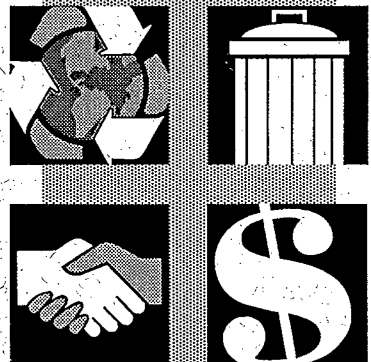
Pollution Prevention Conference XII

July 1996

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WHC-SA-3113-FP

Project C-018 Ammonium Sulfate Reuse



HANFORD SITE

April 1995

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 1

Team and Activity Description

Date 4/17/95 **P2OA ID Code** KHP2OA6.hw **Facility** ICF KH Construction
Activity Project C-018 Ammonium Sulfate Reuse

Team Members (*Leader)	Telephone	MSIN
Ron Del Mar*	376-1967	G7-33
Dave Desmond	372-0702	
Jerry Brown	376-0414	G1-20
Cheryl Steward	372-3970	G7-33
Kerry Dupont	372-1580	S2-51
Mike Schaub	372-3586	S6-75
Jim Kelly	376-4896	S6-75
Armin Vogt	372-3476	T3-28
Marty Huard	372-1570	S2-51

Description of Activity to be Examined in this P2OA

The 200 Area Effluent Treatment Facility, Project C-018, is conducting test runs with chemical mixtures to determine whether the plant operates as designed. Output from test runs is a dry solid chemical mixture of ammonium sulfate and trace concentrations of phosphate. The expected quantity of spent ammonium sulfate mixture from test runs is 54,000 pounds (24,490 kg). Ammonium sulfate is regulated as a Washington State dangerous waste (WT02).

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 2

Activity Flow Diagram

Date 4/17/95 **P2OA ID Code** KHP2OA6.hw **Facility** ICF KH Construction
Activity C-018 Ammonium Sulfate Reuse

Chemical and Radioactive Inputs

Name	Quantity
Sol'n of NH_4OH (with trace amts of $C_{12}H_{27}PO_4$)	378,500 kg
Sol'n of NH_4SO_4 (with trace amounts of H_2SO_4)	137,400 kg

Material Inputs

Name	Quantity
none	

Energy Inputs

Name	Quantity
none	

Activity
Activity Time Period:
200 Area ETF Test Run

Outputs include:
Solid (s)
Liquid (l)
Air (a)

Product or Result Output

Name	Quantity
none	

Hazardous Waste Output

Name	Quantity
NH_4SO_4 (with trace concentrations of PO_4)	24,500 kg

Non-Hazardous Waste Output

Name	Quantity
H_2O	491,400 kg

Radioactive Waste Output

Name	Quantity
none	

Mixed Waste Output

Name	Quantity
none	

Other

Name	Quantity
none	

Total Input mass ≈ Total Output mass 515,900 kg In ≈ 515,900 kg Out

WHC-SA-3113-FP

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 3A

Pollution Prevention Opportunity Description

Date 4/17/95 **P2OA ID Code** KHP2OA6.hw **Facility** ICF KH Construction
Activity Project C-018 Ammonium Sulfate Reuse
P2O No. 1 **P2O Title** NAP Proposal

Current Practice

The 200 Area Effluent Treatment Facility (ETF), Project C-018, recently completed construction. The facility is currently completing test runs with chemicals to determine if the plant will operate as designed. The chemicals for the test runs were supplied by Northwest Agricultural Products Incorporated (NAP Chemical). The supplied chemicals were ammonium hydroxide (NH_4OH), ammonium sulfate (NH_4SO_4), and small volumes of tributyl phosphate ($C_{12}H_{27}PO_4$) and sulfuric acid (H_2SO_4). These chemicals were dissolved into a solution of deionized water and processed through the 200 Area ETF as a simulated waste. The 200 Area ETF is designed to remove chemicals from waste water using a variety of methods (e.g., reverse osmosis, U.V., decomposition filtration, ion exchange, dewatering using a filter press, etc.). The resulting waste is a dry residue (about 40% moisture) of primarily NH_4SO_4, with trace concentrations of phosphate. These removed chemicals are collected in 55-gallon drums. It is estimated that the entire testing process will generate 131 drums of waste material. NH_4SO_4 designates as a Washington dangerous waste under WT02 and requires management and disposal as a dangerous waste. The other chemicals do not designate at the concentrations being generated.

Recommended Action

The test run chemicals are identical in composition to agricultural fertilizer. Upon completion of the 200 Area ETF test runs, the recovered chemicals will have undergone the same type of mixing used by the agricultural industry. However, because the exact concentration of nitrogen and sulfur are unknown, the chemicals cannot be resold as commercial fertilizer. However, they can be given away.

WAC 173-303 provides exemptions from the dangerous waste designation if the chemical is 1) "applied to land and that is their ordinary manner of use" and 2) the chemical can be reused as an "effective substitute for commercial products." ICF KH Environmental Programs and Integration performed a regulatory review of the chemicals and determined that if reused as an effective fertilizer (soil amendment), the product would be exempted from state dangerous waste regulations.

NAP Chemical has proposed to buy back the ammonium sulfate test output product for about $280 a drum. NAP would, in turn, give the product to local farm operations for use as fertilizer. This proposal would avoid disposal of the chemicals as dangerous waste. Part of the NAP proposal is to triple-rinse all 55-gallon drums and return empty drums to the 200 Area ETF for reuse onsite.

WHC-SA-3113-FP

WORKSHEET 3A (cont'd)

Pollution Prevention Opportunity Description

Calculation of Waste Reduction and/or Energy Savings

24,500 kg of hazardous waste (131 55-gallon drums)

Calculation of Annual Cost Savings

131 55-gallon drums of hazardous waste @ $1,300/drum = $170,300

Return of empty drums - 131 drums @ $50/drum = $6,550

Total Savings: $176,850

Calculation of Implementation Cost and Payback

NAP fee $36,680 (Basis: 131 drums @ $280/drum)

Total Savings: $176,850 - $36,680 = $140,170

WORKSHEET 3B

Pollution Prevention Opportunity Description

Date 4/17/95 **P2OA ID Code** KHP2OA6.hw **Facility** ICF KH Construction
Activity Project C-018 Ammonium Sulfate Reuse
P2O No. 2 **P2O Title** Excess Through WHC

Current Practice

The 200 Area Effluent Treatment Facility (ETF), Project C-018, recently completed construction. The facility is currently completing test runs with chemicals to determine if the plant will operate as designed. The chemicals for the test runs were supplied by Northwest Agricultural Products Incorporated (NAP Chemical). The supplied chemicals were ammonium hydroxide (NH_4OH), ammonium sulfate (NH_4SO_4), and small volumes of tributyl phosphate ($C_{12}H_{27}PO_4$) and sulfuric acid (H_2SO_4). These chemicals were dissolved into a solution of deionized water and processed through the 200 Area ETF as a simulated waste. The 200 Area ETF is designed to remove chemicals from waste water using a variety of methods (e.g., reverse osmosis, U.V., decomposition filtration, ion exchange, dewatering using a filter press, etc.). The resulting waste is a dry residue (about 40% moisture) of primarily NH_4SO_4, with trace concentrations of phosphate. These removed chemicals are collected in 55-gallon drums. It is estimated that the entire testing process will generate 131 drums of waste material. NH_4SO_4 designates as a Washington dangerous waste under WT02 and requires management and disposal as a dangerous waste. The other chemicals do not designate at the concentrations being generated.

Recommended Action

This option is identical to Option 1, except that the chemical would be excessed through WHC Excess (for free give-away) instead of being sold back to NAP Chemical. WHC Excess would advertise the availability of the fertilizer onsite and with other DOE sites. If no government agency is interested, Excess would attempt to locate an interested offsite customer. Sample jars are already available to supply to potential customers. Once a customer is found, Excess would coordinate pickup of the chemical. WHC Excess personnel say the time and effort involved in finding a customer for the chemicals would be minimal.

C-018 project personnel would have to generate the appropriate Excess Documentation. Otherwise, this option would not incur any additional costs. The costs associated with drumming and labeling the barrels are not included because they would be incurred no matter which option is selected for disposal/reuse.

Calculation of Waste Reduction and/or Energy Savings

24,500 kg of hazardous waste (131 55-gallon drums)

Calculation of Annual Cost Savings

131 55-gallon drums of hazardous waste @ $1,300/drum = $170,300

Calculation of Implementation Cost and Payback

WHC Excess Costs	$1,000	(Basis: estimate from WHC Excess)
Excess Document Preparation	$180	(Basis: 3 hours @ $60/hour)
Total Cost:	$1,180	

Total Savings: $170,300 - $1,180 = $169,120

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 4

Pollution Prevention Opportunities Summary

Date 4/17/95 **P2OA ID Code** KHP2OA6.hw **Facility** ICF KH Construction
Activity Project C-018 Ammonium Sulfate Reuse

P2O No.	P2O Title	Waste Class Reduced	Annual Waste Reduction or Energy Savings	Estimated Annual Savings	Estimated Implementation Cost	Payback (years)
1	NAP Proposal	hazardous	24,500 kg	$176,850	$36,680	NA
2	Excess through WHC	hazardous	24,500 kg	$170,300	$1,180	NA

Notes and Other Benefits

Another idea considered was to apply the fertilizer material onto a 160 acre "mega trench" site between 200-E and 200-W. Wheat has been planted at this location as a soil stabilizer. However, the WHC project manager in charge of this site says they did not plan to fertilize this area; therefore, the project is not interested in the ammonium sulfate product. WHC Excess will pursue other onsite uses as part of the efforts described under option 2.

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 5

Final Summary

Date 4/17/95 **P2OA ID Code** KHP2OA6.hw **Facility** ICF KH Construction
Activity Project C-018 Ammonium Sulfate Reuse

Proposed Opportunities and Discussion

Both options presented in this P2OA offer significant opportunities for cost savings and hazardous waste reductions. However, the NAP proposal (option 1) may incur unnecessary expenses by paying for a service that can be provided for less cost by WHC Excess.

Option 2 appears to be the best solution, provided a customer can be found for the fertilizer product. It is estimated that whoever takes the product will need at least a 1,000 acre area onto which to apply the fertilizer. The applicator will need to be licensed and have the appropriate equipment and knowledge to put the solid mixture back into solution and apply it using a liquid spreader.

Recommendations and Schedule for Implementation

WHC Excess, C-018 project personnel (ICF KH and WHC), hazardous material specialists, and regulatory analysis personnel were included upfront in the P2OA process. Implementation of Option 2 has, therefore, already been initiated. Project C-018 personnel have put together the necessary Excess Documentation for the ammonium sulfate product. A regulatory analysis was performed to verify that this product is exempt from Washington State dangerous waste regulations if reused as a fertilizer. WHC Excess has initiated the excess process and potential customers have already been located. If a customer cannot be located through the WHC Excess process, the NAP proposal (option 1) should be accepted.

Note:
P2O No.2 has been implemented. Due to a change in testing scope, less NH_4SO_4 was required. A local farmer accepted 8,580 kg of NH_4SO_4 for use on his farm, resulting in a waste cost avoidance of $67,400. Total implementation costs were $1,180.

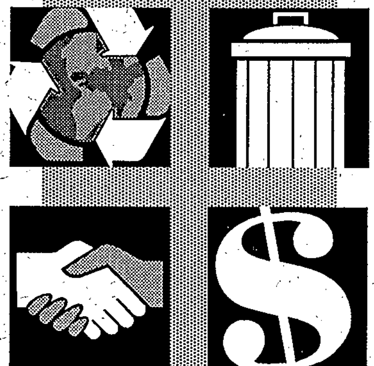
WHC-SA-3113-FP

Prepared for
U.S. Department of Energy
Pollution Prevention Conference XII
July 1996

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WHC-SA-3113-FP

Handling Core Drilling Wastes



HANFORD SITE
September 1994

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

OBJECTIVE

Date 9/6/95 **P2OA ID Code** 95-0001 **Facility** Tank Farms
Activity Handling Core Drilling Generated Wastes from Tanks

Background and Scope

Pollution Prevention is the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source. A Pollution Prevention Opportunity Assessment (P2OA) thoroughly examines work activities and identifies opportunities to minimize the generation of waste.

The Hanford site implemented a Waste Minimization/Pollution Prevention (WM/P2) Program. The program specifies activities and methods that will be employed to prevent pollution from entering the environment, conserve resources and energy, reduce costs, and reduce the quantity and toxicity of waste at Hanford.

TWRS is the largest generator on the Hanford site of wastes as a result of activities such as the operations, maintenance, retrieval, etc. TWRS emcompasses the following facilities: Disposal Programs, Management Systems, Safety and Technical Integration, Tank Farms Transition Projects, and Waste Characterization Project.

This report summarizes a P2OA conducted on "Handling of Core Drilling Generated Wastes From Tanks." Worksheets (Appendix A) included in this report were taken from the pollution prevention opportunity assessment workshop booklet, prepared by the quality training and resource center (DOE, Richland Operations Office).

Purpose and Need

The Pollution Prevention Act of 1990, established pollution prevention as the first choice in environmental management. The 1994 Waste Minimization Pollution Prevention Crosscut Plan is directed at reducing or eliminating the creation of pollutants and wastes at the source. U.S. Department of Energy (DOE) Order 5400.1, requires each DOE Site to have a waste minimization and pollution prevention program.

Establishing pollution prevention programs are beneficial in the following ways: reducing the amount of waste generated; the costs of managing waste is reduced; health and safety risks to workers and the public are lowered; and releases to the environment and company liability are reduced.

P2OAs are performed by identifying the waste streams for each waste class and prioritizing them from most to least hazardous or toxic. The major activities that contribute to each stream are determined and each activity is examined. All inputs and outputs to the activity are identified and the activity flow is recorded. A brainstorming session is then held to develop Pollution Prevention Opportunities (P2Os) to minimize the waste. The P2Os are researched and analyzed for feasibility. After the P2OA is completed, recommendations are summarized in a report.

OBJECTIVE
(cont'd)

Methodology

The P2OA process is a result of individuals generating ideas that may lead to a possible reduction of wastes. Ideas are received and prioritized from the most hazardous or toxic to the least to reduce wastes. Ideas are then used to develop an assessment that identifies opportunities, creates a baseline for monitoring pollution progress, provides economic evaluation, and serves as an improvement tool. Once the assessment is completed and recommendations have been made the next step is to implement the recommendations. The implemented assessment is tracked and later evaluated to determine if improvements are necessary for reducing wastes. The final step is to document the assessment for use by other individuals or facilities thereby preventing a duplication of work.

Summary

In the past, drill strings and wastes, generated by Characterization Engineering, were placed in containers set up in Tank Farms until either the containers are full, the dose rate limit has been reached, or the 90 day clock runs out. Usually, the 90 day clock runs out before containers are full, resulting in containers not being filled to capacity. In a number of cases, containers have been only one quarter full before being sent to the Central Waste Complex (CWC) for long term storage.

The total cost to implement these P2OAs is $770,000.00 over three years.

Recommendations and Conclusions

The recommended action is to fill the container to capacity before shipment, because the disposal cost is the same whether or not the container is full. The existing 90 Day Storage Areas should be changed to Satellite Accumulation Areas (SAAs). Once three drill strings are placed in the container located in a SAA the container would then be placed on a 90 day clock. This process would allow SAAs to be used on an unlimited time basis until three drill strings are placed into a container. This will permit more drill strings to accumulate in the container before a time limit is imposed.

The recommended action is to decontaminate the drill strings allowing their reuse. This would save on the number of drill strings being ordered, cut back on the requested containers, eliminate oversize containers, and would eliminate extra costs for storage of partially empty containers. Decontaminate drill strings would have a high return on investment.

OBJECTIVE
(cont'd)

Description of Alternatives and Solutions

All inputs and outputs into the waste streams are listed on Worksheet 2 (Activity Flow Diagram). Inputs into the stream includes debris, chemicals, and soil. Approximately 996 kilograms of wastes are identified as contaminated wastes from drill string generated wastes for fiscal year 1993. However, the projected amount of wastes that will be generated for 1995 through 1997 is 26 m^3.

A brainstorming session was held to develop options for handling and reducing the volume of wastes generated. Worksheet 3 summarizes the P2Os that came from the brainstorming session. The first P2O recommends the containers be filled to capacity before shipment. This can be performed by changing existing 90 day storage areas to Satellite Accumulation Areas until such time three drill strings are in placed in the container. Once the container has three drill strings the container would be converted to a 90 day storage area to accumulate additional drill strings.

The second P2O recommended no change in current practice of inventoring wastes. There would be no change in waste reduction, annual savings, implementation cost, or payback.

The third P2O recommended decontaminating drill strings for reuse. The waste reduction would be 12.5 m^3 with $319,222.00 annually. The implementation cost would be $256,667.00 a year with a payback of 10 months.

The P2Os are compared on Worksheet 4 which would reduce the amount of waste generated saving approximately $381,481.00 per year. The payback would be 10 months. The recommendations from the assessment are summarized on Worksheet 5.

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 1
Team and Activity Description

Date 9/6/94 **P2OA ID Code** 95-0001 **Facility** Tank Farms
Activity Handling Core Drilling Generated Wastes From Tanks

Team Members (*Leader)	Telephone	MSIN
Bill Ayers	373-1580	T3-28
Malcolm Chunn	376-0662	S7-03
Mary Feucht*	373-2207	R1-51
Steve Gwin	372-7720	Port of Benton, Richland
Dave Nichols	376-4351	B2-22
Andy Cockrell	373-4189	S7-12

Description of Activity to be Examined in this P2OA

Description of Activity to be Examined in this P2OA: This activity will examine how core drilling wastes are generated by Characterization Engineering. Characterization Engineering personnel use drill strings to sample tank wastes. After use, the drill strings are placed in 2'x 2'x 6' boxes for storage and disposal. The containers can hold 6 or 7 drill strings. Frequently, boxes only contain two or three drill strings resulting in a significantly large number of partially empty containers being shipped for long term storage. Storage cost at the Central Waste Complex is based on the external volume of the container and not the internal volume. The result is excessive costs for container storage.

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 2
Activity Flow Diagram

Date 9/6/95 **P2OA ID Code** 95-0001 **Facility** Tank Farms
Activity Handling Core Drilling Generated Wastes From Tanks

Chemical and Radioactive Inputs

Name	Quantity
Lead	1.0 Kg
Copper	7.0 Kg
Aluminum	17.5 Kg

Material Inputs

Name	Quantity
Absorbant	184.1 Kg
Asbestos	1.5 Kg
Plastic	309.2 Kg
Soil	2.7 Kg
Metal	161.5 Kg
Hazardous Constituents (HC) (see Mixed Waste Output):	1.5 Kg
Paper	83.0 Kg
Rubber	129.1 Kg
Cloth	98.2 Kg

Energy Inputs

Name	Quantity
none	

Activity

Activity Time Period: 1 year

Product or Result Output

Name	Quantity
none	

Hazardous Waste Output

Name	Quantity
none	

Non-Hazardous Waste Output

Name	Quantity
none	

Radioactive Waste Output

Name	Quantity
none	

Mixed Waste Output

Name	Quantity
Absorbant	184.1 Kg
Copper	7.0 Kg
Paper	83.0 Kg
Lead	1.0 Kg
Rubber	129.1 Kg
Asbestos	1.5 Kg
Plastic	309.2 Kg
Metal	161.5 Kg
Aluminum	17.5 Kg
Cloth	98.2 Kg
Soil	2.7 Kg
HC see breakdown below:	
Methylene Chloride	0.25 Kg
MEK	0.25 Kg
Acetone	0.25 Kg
Methyl Isobutyl Ketone	0.25 Kg
Cresylic Acid	0.25 Kg
1-1-1 Trichloroethane	0.25 Kg

Other

Name	Quantity
none	

Total Input mass ≈
Total Output mass?
996.3 Kg in ≈ 996.3 Kg out

WORKSHEET 3A

Pollution Prevention Opportunity Description

Date 9/29/95 **P2OA ID Code** 95-0001 **Facility** Tank Farms
Activity Handling Core Drilling Generated Wastes From Tanks
P2O No. 0001-A **P2O Title** Containers in 90-Day Storage Areas

Current Practice

Drill strings and wastes, generated by Characterization Engineering, are placed in containers set up in Tank Farms until either the containers are full, the dose rate limit has been reached, or the 90 day clock runs out. The 90 day clock starts on the day waste is first placed into a container. Usually, the 90 day clock runs out before containers are full, resulting in containers not being filled to capacity. In a number of cases, containers have been only one quarter full before being sent to the Central Waste Complex (CWC) for long term storage.

Recommended Action

The recommended action is to fill the container to capacity before shipment, because the disposal cost is the same whether or not the container is full. The existing 90-Day Storage Areas should be changed to Satellite Accumulation Areas (SAAs). Once three drill strings are placed in the container located in a SAA the container would then be placed on a 90 day clock. This process would allow SAAs to be used on an unlimited time basis until three drill strings are placed into a container. This will permit more drill strings to accumulate in the container before a time limit is imposed.

Calculation of Waste Reduction and/or Energy Savings

In fiscal year 1994 there were 20 sampling projects performed which will be used to establish the baseline. Each container was approximately 25% full based on past practices of disposing of drill strings. To help determine the number of boxes that would be used in the future, the number of sampling projects that are scheduled for 1995 is 45 with 16 sampling projects scheduled in 1996 and in 1997. The total sampling projects over 3 years will be 77. The containers used were 2'x 2'x 6' boxes. The cubic feet to meters conversion requires use of 0.0283 multiplier.

The following formula will be used to determine the future container waste reduction:

$$V_C * \left(\frac{N_D}{N_Y}\right) = C_S$$

where: V_C = Container volume (24 ft^3 x 0.0283 = 0.6792)
N_Y = Number of drill strings per container
N_D = Number of future drill string projected from 1995 through 1997
C_S = Containers saved

$$\frac{0.6792\ m^3}{\text{Container}} \times \frac{77}{2} = \frac{26\ m^3}{0.6792\ m^3} = 39 \text{ containers}$$

The waste reduction would be 26 m^3 (26 m^3/3 years = 8.7 m^3 annually) or 39 containers saved from disposal over three years.

WORKSHEET 3A (cont'd)

Pollution Prevention Opportunity Description

Calculation of Annual Cost Savings

Calculation of Annual Cost Savings: In fiscal year 1994 there were 20 sampling projects performed in Tank Farms. However, the projected number of drill string sampling to be performed in 1995 is 45 with 16 projected in 1996 and in 1997. The cost of disposing a 2'x 2'x 6' container is $146.69 per ft^3 ($3,520.56) for low level mixed waste (LLMW) to be shipped offsite. The labor involved to process the paperwork is approximately eight hours at $60.00 per hour. Each box cost is $800.00. There would be approximately 26 m^3 or 39 containers saved from disposal over three years.

The following equation will be used to determine the annual cost savings:

$$(C_F + C_C + C_L) * N_S = C_S$$

where: C_F = Disposal fee per container (2'x 2'x 6' x $146.69/ft^3)
C_C = Container cost
C_L = Container processing labor cost (8 hr x $60/hr)
N_S = Number of containers saved
C_S = Cost savings

[$3,520.56 + $800.00 + (8 x $60.00/hr.)] x 39 = $187,221.84 or $187,222.00

There would be a cost saving of $187,222.00 over three years or $62,407.00 annually.

Calculation of Implementation Cost and Payback

There is no implementation cost. The payback would be immediate.

WORKSHEET 3B

Pollution Prevention Opportunity Description

Date 9/29/95 **P2OA ID Code** 95-0001 **Facility** Tank Farms
Activity Handling Core Drilling Generated Wastes From Tanks
P2O No. 0001-B **P2O Title** Inventory Core Drilling Wastes

Current Practice

Currently, personnel undress and dispose of personal protective clothing and other debris in containers at the end of a job. The debris and waste are recorded on inventory sheets at the end of the job. It takes approximately one hour to undress and complete the necessary paperwork for container waste inventory.

Recommended Action

Wastes generated during a job should be placed in containers and inventoried as each item is placed in the container. Inventory sheets are required for disposal of all wastes. The time allotted for undressing and filling out necessary paperwork is reasonable. Personnel are using best management practices. No change in current practice is recommended.

Calculation of Waste Reduction and/or Energy Savings

The waste reduction and energy savings remain the same. The time involved has not changed whether the paperwork is filled out during or at the end of the job. There is no waste reduction or energy savings.

Calculation of Annual Cost Savings

There is no cost savings when documenting the amount of wastes generated whether it's during or at the end of the job.

Calculation of Implementation Cost and Payback

There is no implementation cost or payback.

WORKSHEET 3C

Pollution Prevention Opportunity Description

Date 9/29/95 **P2OA ID Code** 95-0001 **Facility** Tank Farms
Activity Handling Core Drilling Generated Wastes From Tanks
P2O No. 0001-C **P2O Title** Decon Auger Drill Strings

Current Practice

Once drill strings are used, the preferred method of disposal has been to place drill strings in 2'x 2'x 6' containers. The container size results in a large number of containers being closed before being filled to capacity. This practice additionally results in a shortage of available containers for waste disposal.

Recommended Action

Recommended Action: The recommended action is to decontaminate the drill strings allowing their reuse. This would save on the number of drill strings being ordered, cut back on the requested containers, eliminate oversize containers, and would eliminate extra costs for storage of partially empty containers.

Calculation of Waste Reduction and/or Energy Savings

In fiscal year 1994 there were 20 sampling projects performed in Tank Farms. Each container was approximately 25% full based on past practices of disposing of drill strings. The containers used were 2'x 2'x 6' boxes. The volume of the drill string is 5.2368 ft^3. A container can hold 6 to 7 drill strings however many containers store 2 or 3 drill strings. An average of two drill strings is assumed to be stored in each container. To help determine the number of boxes that would be used in the future, the number of sampling projects that are scheduled for 1995 is 45 with 16 sampling projects scheduled in 1996 and in 1997. The cubic feet to meters conversion requires use of 0.0283 multiplier.

The following formula will be used to determine the future total decon waste saving:

$$[(V_C * V_P * N_D) + (C_F * N_D)] * F_J = C_S$$

(Container Volume + Drill String Volume) x Increased Number of Jobs = Waste Reduction Saved

where: V_C = Container volume = 24 ft^3 x 0.0283 = 0.6792 m^3
N_D = Number drill strings in 1994
V_P = Percentage of container volume full
C_F = Volume of drill string (5.2368 x 0.0283 = 0.1482 m^3)
F_J = Future jobs from 1995-1997 = 77 future/20 past = 3.85
C_S = Waste reduced

$[(0.6792\ m^3 \times .25 \times 20) + (0.1482\ m^3 \times 20)] \times 3.85 = 24.486\ m^3$

24.49 m^3/3 years = 8.16 m^3 annual waste

The total waste volume of 24.49 m^3 includes the containers as well as the drill strings that would be saved by decontaminating the equipment.

WORKSHEET 3C (cont'd)

Pollution Prevention Opportunity Description

Calculation of Waste Reduction and/or Energy Savings (Cont'd)

In fiscal year 1994 there were 20 sampling projects performed which will be used to establish the baseline. Each container was approximately 25% full based on past practices of disposing of drill strings. To help determine the number of boxes that would be used in the future, the number of sampling projects that are scheduled for 1995 is 45 with 16 sampling projects scheduled in 1996 and in 1997. The total sampling projects over 3 years will be 77. The containers used were 2'x 2'x 6' boxes. The cubic feet to meters conversion requires use of 0.0283 multiplier.

The following formula will be used to determine the future container waste reduction:

$$V_C * \left(\frac{N_D}{N_Y}\right) = C_S$$

where: V_C = Container volume (24 ft^3 x 0.0283 = 0.6792)
N_Y = Number of drill strings per container
N_D = Number of future drill string projected from 1995 through 1997
C_S = Containers saved

$$\frac{0.6792\ m^3}{\text{Container}} \times \frac{77}{2} = \frac{26\ m^3}{0.6792\ m^3} = 39 \text{ containers}$$

The waste reduction would be 26 m^3 (26 m^3/3 years = 8.7 m^3 annually) or 39 containers saved from disposal over three years.

The drill string waste reduction due to reuse is determined by the following equation:

Number of drill strings x Volume of drill strings

77 x 0.1482 m^3 = 11.41 m^3

The total waste reduction by saving containers and drill strings is 37.41 m^3 (26 m^3 + 11.41 m^3).

WHC-SA-3113-FP

WORKSHEET 3C (cont'd)

Pollution Prevention Opportunity Description

Calculation of Annual Cost Savings

There were 20 sampling projects identified in fiscal year 1994 in Tank Farms. However, approximately 45 sampling projects have been identified for 1995 with 16 projected in 1996 and in 1997. The cost of disposing a 2'x 2'x 6' container is $146.69 per ft^3 for low level mixed waste (LLMW) to be shipped offsite. The labor involved to process the paperwork is approximately eight hours at $60.00 per hour. Each box cost is $800.00. There would be approximately 26 m^3 or thirty-nine containers saved from disposal.

The drill string decon cost (comprises 94 pieces) is approximately $8,000.00 to $12,000.00. The wide cost range is contingent upon whether the drill string is slightly or heavily contaminated. The average cost to decon a drill string is assumed to be $10,000.00. The average drill string cost is $20,000.00.

The following equation will be used to determine the waste cost saving:

$$[(C_F + C_C + C_L) * N_S] + (C_D * N_D) = C_S$$

Container Cost + Drill String Costs = Cost Saving

where: C_F = Disposal fee per container (2'x2'x6' x $146.69/$ft^3$)
C_C = Container cost
C_L = Container processing labor cost (8 hr. x $60.00/hr)
N_S = Number of containers saved
C_D = Cost of drill string ($20,000)
N_D = Projected number of drill strings between 1995-1997
C_S = Cost savings

{[($3,520.56 + $800.00 + $480.00) * 39] + ($20,000 * 77)} = $1,727,221.84 or $1,727,222.00

The equation below will be used to determine the annual savings: $\frac{C_T - (N_D * C_D)}{N_Y} = T_S$

where: C_T = Total Cost
N_D = Number of drill strings
C_D = Cost to decon drill strings
N_Y = Number of years
T_S = Total Savings

$$\frac{\$1{,}727{,}222.00 - (77 * \$10{,}000.00)}{3} = \$319{,}074.00 \text{ annual savings}$$

The total annual saving would be $319,074.00 by decontaminating drill strings. The savings over three years would be $957,222.00.

Calculation of Implementation Cost and Payback

The implementation cost would be the cost to decon drill strings which is $256,667.00 per year or $770,000.00 over three years. The payback would be 0.8 or 10 months.

Drill string cost: $\frac{77 * \$10{,}000}{3 \text{ years}} = \$256{,}667.00$ per year

Payback: $\frac{\$256{,}667.00}{\$319{,}074.00} = 0.8$

WHC-SA-3113-FP

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 4

Pollution Prevention Opportunities Summary

Date 9/29/95 **P2OA ID Code** 95-0001 **Facility** Tank Farms

Activity Handling Core Drilling Generated Wastes From Tanks

P2O No.	P2O Title	Waste Class Reduced	Annual Waste Reduction or Energy Savings	Estimated Annual Savings*	Estimated Implementation Cost	Payback (years)
A	Containers in 90-Day Storage Areas	LLMW	8.7 m^3	$62,407.00	None	Immediate
B	Inventory Core Drilling Wastes	LLMW	None	None	None	None
C	Decon Auger Drill Strings	LLMW	12.5 m^3	$319,074.00	$256,667.00	10 Months

Notes and Other Benefits

WHC-SA-3113-FP

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

WORKSHEET 5

Final Summary

Date 9/29/95 **P2OA ID Code** 95-0001 **Facility** Tank Farms

Activity Handling Core Drilling Generating Wastes From Tanks

Proposed Opportunities and Discussion

Core drilling wastes generated during a job are placed in containers and inventoried at the end of the job. The one hour time allotment includes undressing and filling out the necessary paperwork, such as inventories, on the container wastes for disposal.

Not filling containers near capacity results in a waste of funds as well as storage space. This would result in a waste reduction of 26 m^3 with a cost savings of $187,222.00 over three years.

The waste and cost reduction would decrease significantly by decontaminating drill strings. The waste reduction would be 37.4 m^3 with a cost saving of $957,222.00 over three years.

Recommendations and Schedule for Implementation

A recommendation is made to fill containers to capacity because the cost for disposal is the same whether the container is partially or completely full. Tank Farms is charged based upon the external volume of the container by Solid Waste Disposal regardless of the internal waste volume. The problem could be resolved by establishing a temporary SAA in the farms for collecting only drill strings. Once three drill strings are placed in the container, the container then would be converted to a 90 day pad for collecting additional drill strings. This practice would allow more drill strings to fill the container and the contents would be identified as a unique waste stream. Other wastes generated would be placed in separate containers.

The recommendation is to decontaminate drill strings that would alleviate the need for container requests as well as save on new drill string purchases, disposal fees, and time. Decontaminating drill strings would see the highest return on investments in the shortest period.

In the future, Characterization Engineering will be performing more core sampling than in the past. The decontamination of drill strings should be used thereby making efficient and cost effective use of storage and disposal of the wastes. The schedule of implementation would be 10 months.

WHC-SA-3113-FP