MEETING REPORT

AUTHORS: G. K. Jacobs and K. L. Von Damm

LOCATION: Columbus, Ohio

DATE: January 22-24, 1986

PURPOSE: SRP/NRC Waste Package Workshop for Salt Sites

PROJECT TITLE: Technical Assistance in Geochemistry

PROJECT MANAGER: G. K. Jacobs

ACTIVITY NUMBER: ORNL #41 88 54 92 4 (FIN No. B0287)
NRC #50 19 03 01

A workshop related to waste package issues for a repository in salt was held in Columbus, Ohio during January 22-24, 1986. Attendees (see Attachment #1) included representatives from the Salt Repository Project (SRP/DOE) and its contractors, NRC staff and contractors, DOE-HQ and support staff, and the states of Mississippi and Louisiana. The purpose of the workshop (see Attachments #2 and #3) was to discuss the status and approach to waste package design, testing, and modeling for a representative salt site. The basis for discussion was the Deaf Smith County Site in Texas, but much of the data and analyses were "generic" in nature and applicable to other candidate salt sites.

From our perspective, the workshop was extremely valuable. A significant amount of technical information was presented clearly and supported by handouts and draft reports made available to the workshop attendees (these materials have been entered into our data base). Plans for the next 12-15 months were discussed, but without much detail. Therefore, it was difficult to determine from the workshop alone if the plans of SRP will be adequate to resolve all important issues related to the waste package. However, the workshop provided an excellent basis for future discussions in more detailed subject areas. Specific observations related to geochemical issues with the waste package are discussed below.

OBSERVATIONS

1. SRP is emphasizing "expected" conditions in their testing and modeling analyses. We agree with this approach as a means of beginning to obtain some basic data and to begin to develop an understanding of the important processes involved. However, we feel that broadening the range of some key parameters in the testing program may be desirable -- especially until such time as significant site-specific data can be obtained. Examples include the chemistry of brines for waste form and corrosion testing and the quantity of brine assumed to reach waste packages for performance assessment analyses (see also observations #2 & #3).

2. Brine migration continues to be an issue. SRP will attempt to validate the Jenks model, which is assumed to give conservative results, using laboratory and field tests (Asse Mine and site-specific when available). Although we have some concerns that the Asse Mine may not be a good analogy for the candidate salt sites in the U.S., we urge that this activity be continued. We also have some concern about other potential sources of water within the repository horizon. For example, SRP has given little thought to possible scenarios involving the water-bearing carbonate zones directly above and below the Unit 4 horizon. Brines have been pumped from some wells within the Palo Duro Basin from the basal carbonate of the Unit 4 salt horizon. In addition, the clay interbeds remain a potential source of fluids that SRP has not adequately addressed.

3. Some uncertainty remains over the chemistry of brines that may contact the waste packages. Brine resulting from the thermal migration of fluid inclusions will obviously be a high-Mg brine. However, new work by PNL for the SRP has shown that brines resulting from a dissolution scenario may also attain high levels of magnesium. The tests, which involved contacting a saturated brine with crushed, whole-rock salt from the Palo Duro Basin, resulted in high-Mg brines. The kinetics of this exchange process in salt that has not been crushed may be somewhat slower and the generation of a high-Mg brine is not certain. Further work on this subject seems appropriate in light of the sensitivity of canister corrosion to the magnesium content of brines.

4. The modeling of results from earlier waste form tests at PNL has produced some excellent results. Many of the earlier results pertaining to glass dissolution coupled with solubility controls can be interpreted in a mechanistic sense with some confidence. Although the model developed by PNL may not be used for final waste package performance assessment because of a lack of data on the surface area-to-volume of waste forms in an actual waste package, the model provides an excellent foundation to build more empirical, but defensible models for actual performance assessment calculations. The effect of the presence of canister materials on waste form behavior is not yet well understood. PNL is making significant strides, but additional testing and model development is required (see also observation # 5).

5. The waste form testing program for actual spent fuel is in the early stages of development. The program appears to be addressing the major issues but, as with other portions of the SRP program, is emphasizing expected conditions only. The workshop did not allow us to adequately discuss the actual details of the test philosophy and procedures of waste from testing. Therefore, specific technical concerns about the testing program will have to be addressed through a more detailed meeting.

ANTICIPATED ATTENDEES
SRP/NRC WASTE PACKAGE MEETING
January 22-24, 1986

NRC

Susan Bilhorn (WMRP)
George Birchard (RES/WM)
Pauline Brooks (WMRP)
Robert Johnson (WMRP)
Timothy Johnson (WMEG)
Walton Kelly (WMGT)
Michael McNeil (RES/WM)
Charles Peterson (WMEG)
Michael Tokar (WMEG)
Tilak Verma (on-site representative)
John Voglewede (WMEG)

NRC Support

John Holbrook (BCD)
Charles Interrante (NBS)
Gary Jacobs (ORNL)
Michael Kaufman (NBS)
Jack Parry (ACRS)
Paul Shewmon (ACRS)
Robert Shull (NBS)
Peter Soo (BNL)
Kenneth Stephens (Aerospace Corp.)
Karen Von Damn (ORNL)

Other Projects

G. Harper (Rockwell/BWIP)
P. LaMont (RL/BWIP)
Bill McKenzie (Livermore/NNWSI)
Mike Valentine (NNWSI)

States

Don Christy (Mississippi)
Frank Kendorski (Louisiana)

DOE

Naomi Abraham (OGR)
Andy Avel (SRPO)
Ram Lahoti (SRPO)
Jeff Williams (SRPO
Roger Wu (SRPO)
Robert Wunderlich (SRPO)

DOE-HQ Support

Mike Apted (PNL)
E. Gause (Weston)
B. S. Lee (BNL)
C. Sastre (BNL)
Don Schweitzer (BNL)
S. Vogler (ANL)
Henry Wiot (Weston)

SRPO/ONWI Support

John Carr (ONWI)
Jim Cunnane (ONWI)
Matt Golis (ONWI)
George Jansen (ONWI)
John Kircher (ONWI)
Vicki McCauley (ONWI)
Him Perrin (ONWI)
Gil Raines (ONWI)
Jim Schornhorst (ONWI)
Don Bradley (PNL)
Wyman Harrison (ANL)
Gary McVay (PNL)
Robert Paddock (ANL)
Larry Pederson (PNL)
Richard Westerman (PNL)

Other

Al LaSala (USGS)
Dave Tillson (EEI/Consultant)

SRP/NRC Waste Package Meeting

January 22-24, 1986
Columbus, Ohio
Conference Room G

AGENDA

January 22, 1986

8:30 a.m. Introduction
- Introduction of Participants (SRP/NRC/Others)
- Announcements/Arrangements

Opening Remarks
- DOE Opening Remarks
- NRC Opening Remarks

A. Overview of the Waste Package Program

9:00 a.m. Program Approach and Strategy
- Organization
- Philosophy
- Design Approach
- Performance Verification Strategy

9:45 a.m. Waste Package Concept Description
- Design Description
- Component Functions/Performance Allocation
- Design Rationale/Materials Selection
- Favorable Features
- Major Design Uncertainties
- Failure Modes and Processes
- Effects of Emplacement Mode

12:00 Lunch

1:00 p.m. Performance Assessment of Waste Packages
- Performance Assessment Strategy
- Interfaces with Design and Testing
- Development of Submodels
- WAPPA Model Description
- Treatment of Uncertainties
- Code and Model Validation
- Role in Licensing

3:30 p.m. Break

3:45 p.m. Quality Assurance and Peer/Technical Review
- Quality Assurance Programs
- Technical Test Procedures
- Technical/Peer Review

5:00 p.m. Adjourn

January 23, 1986	**B. Technical Focus of the Waste Package Program**
8:30 a.m.	Waste Package Environment • Preemplacement Conditions • Heat Effects on Salt and Brine • Thermomechanical Effects • Radiation Effects • Preclosure/Operational Factors • Integrated Effects/Field Tests • Expected/Unexpected Conditions • Impact on Modeling • Status of Data
11:30 a.m.	Waste Package Containment • Failure/Degradation Processes — General Corrosion/Test Design — Nonuniform Corrosion — Crushing — Others • Factors Affecting Processes • Status of Data • Major Uncertainties/Issues • Development of Submodels
12:30 p.m.	Lunch
1:30 p.m.	Waste Package Containment (Continued)
3:30 p.m.	Waste Package Release • Package Failure/Release Scenarios • Expected Processes • Status of Data • Major Uncertainties/Issues • Development of Models
5:00 p.m.	Adjourn

January 24, 1986

8:30 a.m.	Waste Package Release (Continued)
	C. Planned Activities of the Waste Package Program
10:00 a.m.	• Waste Package Environment • Waste Package Containment • Package Release • Design and Development • Performance Assessment • Future Potential Meetings/Data Reviews
	D. NRC Presentations
10:45 a.m.	• Summary of Observations on DOE Programs • Substantially Complete Containment for Short Half-Life Radionuclides • Individual Radionuclide Release Data for Licensing • Waste Package/Engineered Barrier System Boundary Definitions • Pitting Studies
12:00	Lunch
	E. Questions and Summary
1:00 p.m.	General Discussions/Questions
3:00 p.m.	Preparation of Minutes
4:00 p.m.	Summary and Minutes Discussion
5:00 p.m.	Adjourn

DOE/NRC SALT WASTE PACKAGE WORKSHOP

Objectives

1. To present the NRC staff and other participants the DOE-Salt Repository Program's current status and approach to waste package design and development and its contribution to the potential licensing of a salt geologic repository. Emphasis will be placed on recent changes in waste package design and supporting information, rather than a review of previously published documents. These would include:

   a) A description of the overall SRP waste package program approach and strategy with regard to design and performance verification.

   b) A description of the current package design including components/functions, materials, and design rationale.

   c) A description of SRP performance assessment approach including strategy, model development, interaction with design, treatment of uncertainties and code and model validation.

   d) A description of the SRP Quality Assurance program and the uses of peer/technical review.

   e) A description of the waste package near-field environment including uncertaintites, issues, status of data, and waste package effects (heat, radiation, etc.).

   f) A description of the SRP program studying waste package containment including failure/degradation processes, uncertainties and issues, and status of data.

   g) A description of the SRP program studying waste package release including failure/release scenarios, uncertainties/issues and status of data.

2. To answer questions and receive NRC comments on the SRP waste package program and its applicability to the requirements of 10 CFR 60 and NRC staff perceived licensing needs.

3. To describe the SRP term (FY 86) planned activities in the waste package area to assist NRC and others in following the SRP program including exchange of ideas on future meetings and data reviews.

4. To have the NRC staff feedback to the DOE-SRP program through:

   a) Expression of NRC concerns of the issues related to the SRP waste package program

   b) Presentations on several topics/issues which would influence the DOE program based on NRC interpretation of the requirement of 10 CFR Part 60. (See Agenda for Specific Topics).