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In This Issue

NMT Division Completes First Three-Year Review Cycle

Committee members (left to right) Dr. Gregory Choppin, Dr. Ned Wogman, and Dr. Stephen Carpenter with NMT Division Director Bruce Matthews.

On March 17–19, 1997, NMT Division held its third Science and Technology Assessment (also called "the Division Review") in the J. Robert Oppenheimer Study Center and in the TA-55 Access Center. With the completion of this year's Science and Technology Assessment on "Stockpile Stewardship and Space Mission," NMT has covered all of its programmatic efforts and other diverse scientific and technical activities. During each of the three reviews, the division also highlighted topical infrastructure and facility operations.

An eleven-member (see page 11) Division Review Committee convened the evening of the 16th for a logistical session, and for the next day and a half the committee listened to presentations ranging from a state-of-the-division message to overviews of NMT's major programs. On the facility operations side, they heard presentations on the Operations Center Upgrade Project, the Capabilities Maintenance and Improvement Project, and media tours during the review year. Poster presentations the afternoon of the second day featured NMT's science and technology activities and accomplishments falling under the main review theme. On the third day of the review, the committee moved to TA-55 and had further, separate discussions with the Nuclear Materials and Stockpile Management (NMSM) Program Director Paul Cunningham, several DOE representatives, and a few NMT technical staff members. In addition to the full committee, the close-out session was attended by Laboratory Deputy Director Pete Miller, who represented the Director's Office; Al Sattelberger and Allen Hartford, both from the Science and Technology Base Program Office; NMSM Program Director Paul Cunningham; NMT Division Director Bruce Matthews; Deputy Dana Christensen; and other NMT members.

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There are four review criteria agreed upon by the UC Science and Technology Panel of the UC President's Council on the Management of National Laboratories and the Laboratory. The same criteria have been used for the past three years:

- **Quality of science and engineering,**
- **Relevance to national needs and agency missions,**
- **Performance in the construction and operation of major research facilities, and**
- **Programmatic performance and planning.**

Although the final written report will not be sent to Laboratory Director Sig Hecker and the University of California (UC) Science and Technology Panel for several weeks, the Division Review Committee made a number of positive comments on the progress of NMT in all review criteria (see sidebar) at the close-out session. The committee also praised the Division Review effort made by the division technical staff and the supporting staff as well as the management team.

Because of the classified nature of this year's review, the preparation of the review documents and presentations and poster papers at the Study Center required careful planning and execution. In the end, the review sessions were well attended by over 100 registered participants. With the successful completion of this year's review, NMT Division has achieved important milestones toward meeting all of its programmatic, scientific and technical, and facility operational goals.


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Guest Editorial

Tomorrow's Pen is Mightier than Yesterday's Sword

by Dana C. Christensen

It is very easy to get caught up in the "hubbub" of daily activities, concentrating on specific projects, their scopes, schedules, and budgets. In doing so, we may lose track of the greater goal of reducing the global nuclear danger. It is important to pause and consider this Laboratory's evolving role and evaluate its importance in achieving the greater goal. The nation's work, and thus *our* work, with plutonium falls into three clear challenges, with no one being more important than the other: 1) legacy cleanup, 2) nonproliferation and arms control, and 3) national security, including both military and energy security. In meeting these challenges we can do much to reduce the global nuclear danger.

The question, thus, becomes how to position the whole of TA-55 to meet these important challenges. A successful approach, demonstrated on projects such as ARIES, Operations Center Upgrade, and 40-mm Launcher Activation, was to establish integrated teams with others who have a wide variety of skills. This will continue to be an approach used into the future. But perhaps our most critical challenge involves assuring the health of core competencies within our own operations. We are already seeing a movement away from fundamental and applied R&D toward an emphasis on "production" and are discussing this threat with our program offices and sponsors. As we configure our programs in the future, assuring that core science and technology are properly supported will become essential. In order to succeed in achieving a balanced set of activities, we must be able to show that all activities point toward the goal of reducing the global nuclear danger. We will likely also need to identify how fundamental R&D is essential in achieving program successes.

At the recent NMT Division Review, Steve Younger, Program Director for Nuclear Weapons Technology, discussed how, without nuclear testing, peer review of journal articles is essential in maintaining and communicating our ability to design and deploy the nuclear deterrent. This concept likewise applies to TA-55. Our stature in professional and political communities will be known only through peer recognition from elsewhere in the country and the world. Therefore, we must help ourselves by becoming more visible at professional meetings, more involved in professional societies, and more frequently published in professional journals.

It is interesting that demonstrated military strength was the successful vehicle for achieving significant arms reductions in the START I and II treaties. Future arms reductions will be achieved only through a continued demonstration of strength, but this strength will not be demonstrable through the periodic testing of nuclear weapons. Today, the display of our nation's strength can be achieved only through successful demonstration and deployment of technology and through recognition by our peers throughout the world. This means that investment in both applied and fundamental technology is the necessary precursor to continuing down the path to peace. Taking the time to prepare publications and to present results in various public forums is becoming an essential aspect of performing our work. Each individual can have a significant impact on our ability to attract sufficient funds in the future. Indeed, this continued sponsor investment, followed by our commitment to communicate that strength, will allow the United States to influence the rest of the world in the long-term management of all plutonium inventories, and will therefore allow us to achieve the goal of reducing the global nuclear danger.

"Today, the display of our nation's strength can be achieved only through successful demonstration and deployment of technology and through recognition by our (scientific) peers throughout the world."

Dana C. Christensen, Deputy Director of NMT Division, and **John Berg** at the recent Division Review.

Study Addresses Chloride Tolerance Limits for the Safe Processing of Radioactive Salts

Researchers on this project are **D. G. Kolman, D. K. Ford,** and **T. O. Nelson,** NMT-6; and **D. P. Butt,** MST-6.

The processing of actinide salts in nitric acid process streams at Savannah River Site plays an important role in high-level radioactive waste reduction and in the long-term storage of radioactive material throughout the Department of Energy (DOE) complex. Container materials such as pipes and holding vessels for nitric acid process streams are typically composed of American Iron and Steel Institute 304 stainless steel (304 SS), a commonly used austenitic SS. However, the corrosion resistance of 304 SS exposed to nitric acid/halide environments has been questioned. Preventing corrosion failure of the 304 SS system is critical to avoid worker and environmental contamination and to mitigate adverse economic impact. Aware of these potential problems, SRS consulted with the Materials Corrosion and Environmental Effects Laboratory at Los Alamos National Laboratory, requesting an examination of the chloride tolerance limits for the nitric acid process stream.

In general, the corrosion behavior of 304 SS has been very well documented. The recent literature alone is replete with studies of general and localized corrosion of 304 SS exposed to nitric acid solutions and to sodium chloride (NaCl) solutions, individually. However, little work incorporating the corrosion of 304 SS exposed to solutions containing both nitric acid and NaCl has been published. The majority of these tests have only examined weight loss or surface state (via microscopy) without monitoring the electrochemical behavior of the system. The motivation for our study arises from the fact that in published studies: 1) different alloy compositions have been used, 2) various cations have been incorporated (e.g., $NaNO_3$ vs. nitric acid, NaCl vs. $FeCl_3$), 3) different testing periods have been used, and 4) different solution volume-to-surface-area (V:A) ratios have been used. All of the preceding variables have been shown to affect corrosion behavior. Therefore, unification of data from the literature into a comprehensive understanding of corrosion susceptibility is nearly impossible. This is especially true in light of the fact that corrosion has been hypothesized to be autocatalytic, rendering comparisons between studies with differing test periods and V:A ratios difficult. In fact, these parameters are not presented in many of the studies. Moreover, almost none of these studies utilized modern electrochemical methods that allow an assessment of the susceptibility of materials to corrosion given a change in environmental conditions.

The differences between the various studies are exacerbated by the fact that nitrates are powerful passivating agents, and chlorides are powerful depassivating agents. Their strongly opposite effects may be altered by changing variables such as alloy composition and microstructure, solution composition, and test procedures. The objective of this study, therefore, was to document the general corrosion behavior of stainless steel using modern electrochemical techniques including potentiodynamic scans and open-circuit-potential measurements, especially between 0.01 and 1 M nitric acid where little work has been performed. In particular, the effects of nitric acid concentration (0.041 M to 12 M), chloride concentration (0.01 to 3 M), temperature (room temperature to boiling), and time of exposure on the corrosion behavior of 304 SS were of interest. A second objective of this work was to confirm the autocatalytic nature of general corrosion in nitric acid/chloride environments as has been proposed by others. Additionally, this study sought to compare the behaviors of 304 L SS (a low-carbon version of 304 SS often used for applications where the material is welded) and sensitized 304 SS (which mimics welded 304 SS) to that of 304 SS over a wide range of conditions in order to discern any effects of material composition and microstructure (see Figure 1).

The corrosion behavior of 304 SS was examined as a function of nitric acid and chloride concentrations, using sodium chloride as a surrogate for actinide salts. Depending on solution composition, three different material responses were observed. The first behavior type was continuous passivity following immersion. A material is defined to be passive when a tenacious oxide forms on the material, imparting excellent corrosion resistance. This state is observed during corrosion testing when the corrosion rate (measured as current density) is independent of the driving force for corrosion (the applied voltage). For example, the good corrosion resistance of stainless steel, aluminum, and titanium under normal atmospheric conditions is a result of passive film formation.

The second type of behavior observed was formation of a passive film followed by localized corrosion (pitting). This type of behavior is unacceptable for service because through-wall failures can occur in a very short time. The third type of behavior was active/passive corrosion. In this type of behavior, 304 SS was found to dissolve actively at a relatively high rate following immersion. The corrosion rate was subsequently observed to increase at an exponential rate with time as a result of the autocatalytic reduction of nitrate (NO_3^-) Corrosion (or penetration) rates as high as 80 inches per year were shown to be possible.* The period of active dissolution was followed by passive film formation, which resulted in much reduced corrosion rates (as much as 100,000 times). Spontaneous passivation was shown to arise solely from changes in solution chemistry as opposed to changes of the surface itself. The period of active corrosion was found to increase strongly with the V:A ratio. Therefore, it is conceivable that for certain solutions and V:A ratios, the total material loss preceding passivation may be acceptable. However, using the most conservative approach, the safe operating regime is best defined by solutions that promote continuous passivity. Thus, for a given nitric acid concentration, the conditions for safe operation are defined as chloride concentrations that promote continuous passivity of 304 SS.

Other pertinent variables were examined also. For instance, the effects of material composition and microstructure on the corrosion behavior of 304 SS were detailed. The corrosion behavior of 304 L SS and sensitized 304 SS were compared to 304 SS. No consistent differences between 304 SS, 304 L SS, and sensitized 304 SS were apparent in solutions yielding active dissolution, passive dissolution, or pitting. The effect of temperature was also determined. In summary, it was found that increasing solution temperature increased the corrosion rate as well as the susceptibility to both pitting and active dissolution.

The results of this study indicated that the corrosion of 304 SS exposed to nitric acid/chloride environments is complex. The corrosion behavior was found to be dependent on nitric acid concentration, chloride concentration, temperature, V:A ratio and time. The study yielded a more complete understanding of the mechanisms of corrosion of 304 SS exposed to nitric acid/chloride environments as well as determining chloride tolerance limits for the safe processing of actinide salts in a nitric acid process stream.

*Corrosion rates are always reported as penetration distances (i.e., the thickness of material lost from a surface). So if a sample surface is exposed for 1 year and the sample is 1" thick before exposure and 0.9" thick following exposure, the the corrosion rate is 0.1" per year (or in corrosion terms 100 mils per year).

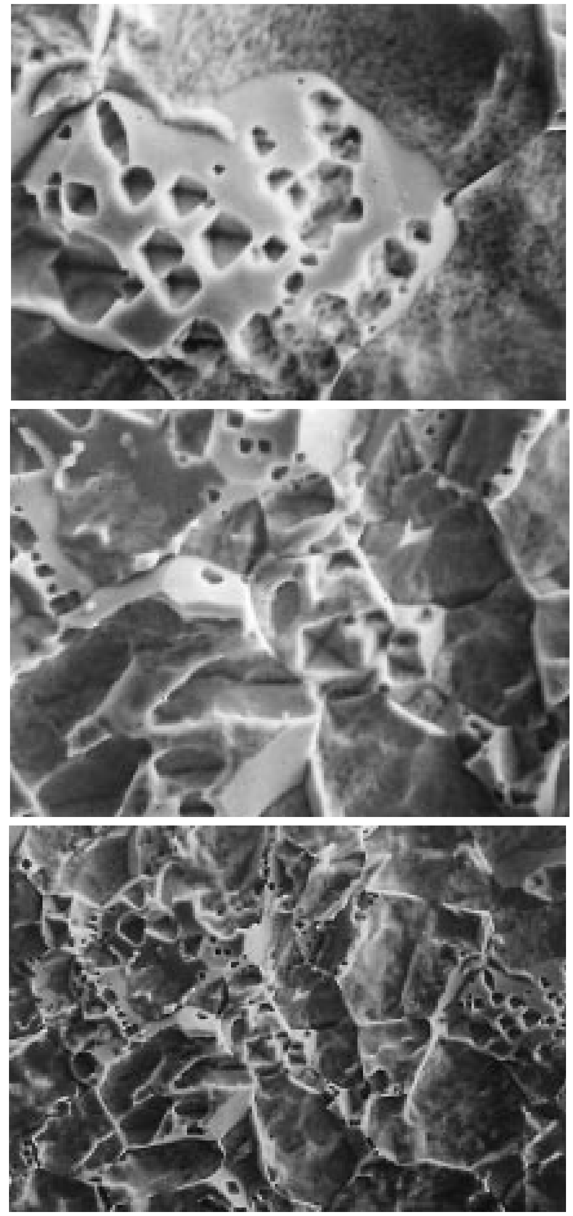

Figure 1: These optical micrographs show crystallographic or faceted pitting of 304 SS following a one-week immersion in 4.1 M nitric acid plus 1 M sodium chloride. Microscopy was one of a variety of approaches within the overall research program to evaluate the influence of environmental and material effects on the corrosion behavior of stainless steel exposed to simulated waste-processing environments.

Computer-Based Waste Management System Reaps Benefits

A new computer-based transuranic (TRU) Waste Management System is being implemented at the Plutonium Facility at Los Alamos National Laboratory (LANL). It is a distributed computer processing system stored in a Sybase database and accessed by a graphical user interface written in Omnis7, a client/server development tool. The system resides on the local area network at the Plutonium Facility and is accessible by authorized TRU waste originators, Nondestructive Assay (NDA) Laboratory personnel, radiation protection technicians, quality assurance personnel, and waste management personnel for data input and verification. The tracking system has changed the TRU paper trail into a computer trail, saving time and eliminating errors and inconsistencies in the process.

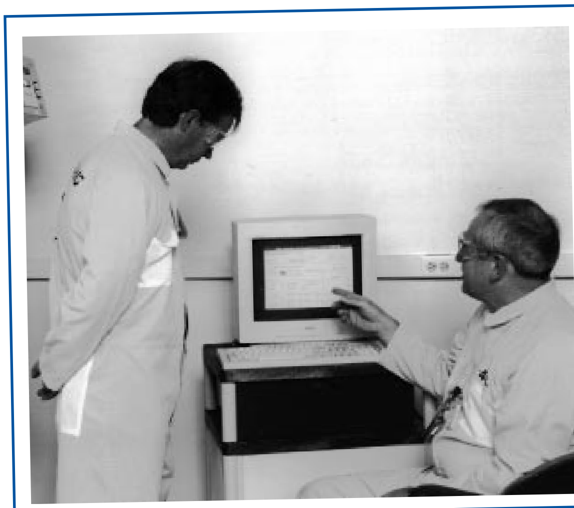

Figure 2: Dennis Wulff (right) points out features of the computerized Waste Management System to Chester A. Smith, Jr. Input from users such as these helped design a system that provides accurate tracking of transuranic waste throughout the Los Alamos Plutonium Facility.

The Nuclear Materials Technology Division as the landlord of the Plutonium Facility has recognized for many years that cradle-to-grave tracking of TRU waste could be done most expeditiously by a computer network-based, real-time data generation and tracking system. Towards this goal, the system was conceived in 1991 and then launched in 1993 with a week-long meeting of users and programming personnel to determine the system requirements. Phased implementation of the system inside the Plutonium Facility began in August of 1995 with the submittal of waste information by the waste originator to the materials management and waste management groups. Full implementation is anticipated in April 1997.

The Plutonium Facility is the largest generator of TRU waste at LANL, producing approximately 500 new containers of waste per year. The facility is anticipating an expanded mission and upgrades that will increase the waste production rate. The plutonium processing area in the facility has 530 waste originators and about 100 processes operating in over 300 glove boxes. The TRU waste generated at the Plutonium Facility consists of solid (debris) waste and immobilized liquid (cemented) waste. The waste is primarily contaminated with plutonium isotopes and is destined for disposal at the Waste Isolation Pilot Plant (WIPP).

The tracking system data are stored in the Sybase database, which resides on a Sun Workstation. The client/server computing breaks programs into two parts: one part on the local workstation—the client—that requests data and the rest on one or more server machines that supply the data. This program can be run using Windows 3.1, Windows 95, Windows NT, and Macintosh operating systems. The implementation of the system required that upgrades to networking capabilities be made throughout the Plutonium Facility so that originators would have the ability to log on to the system in their own processing rooms and input the waste item information.

Two of the major hurdles in the implementation of this system were the quality assurance requirements for signatures and an auditable trail of changes made to the data. These problems were resolved by requiring users to log onto the system and by setting up a table of authorities identifying who could change records, and tables to track changes.

For debris waste, the process starts when the waste originator logs on to the system and characterizes the waste. The waste item is then assigned a unique identifier. The new waste item is visually inspected and approved online by personnel of the waste management group. At the time of approval rigorous checks are in place to ensure that all information is complete. Once approved, the item is eligible for assay. The waste originator requests an assay on-line, and the item then appears on the list of items ready for assay in the NDA Laboratory. The NDA personnel measure the item and enter the results of the assay into the system. The system compares the assay to the discard limits for the item and displays the two values. If the item meets the discard limit, it then becomes available for packaging into a waste container.

As each item arrives in the waste management room, waste management personnel use the system to locate the appropriate container and place the item in the container. Weight and assay values are entered into the computer system to verify that the addition of this item will not exceed weight limits or limits on special nuclear materials. Personnel then don respirators for the actual packing. One person sits at the computer terminal while the others do the packing. When packing is complete, the final measured gross weight of the container is entered. The calculated weight of the container has been created by the computer and is displayed for comparison. The packed container is then physically closed and final calculations are performed.

The closed and sealed container undergoes a confirmation assay by the NDA Laboratory. The computer does all calculations previously done by NDA Laboratory personnel to confirm that there is no significant difference between the container assay and the sum of the assays of all items in the container. The process for cemented waste differs somewhat from debris waste. In particular, liquid processing calculations previously done by hand are now done by the system, and no confirmation assay is done.

The closed and sealed container must be swiped and surveyed by WIPP-certified radiation protection technicians. The system presents the technicians with allowable instrument numbers and automatically alerts them when an instrument is out of calibration. It will not allow measurements to be done by an out-of-calibration instrument. The system checks the measurements against facility and WIPP limits and prevents containers from being released if they exceed those limits.

The TRU-waste data package can be viewed on-line at any time during the processing. All approvals are listed so that viewers may determine the stage in processing for a given container. Using the computer system, personnel complete all paperwork in the data package at this point. The data package forms are created on the network only, and no paper will be transferred outside of the radiation-controlled area. Each approver logs on to the system and issues his/her approval. Approvers are notified electronically when the data package is ready for each level of review and approval.

When all approvals have been given, the data package coordinator prints the data package that will accompany the container when it leaves the facility. To assure control of the printed data package, the coordinator is the only person authorized to print the package.

Numerous benefits have already been realized using the tracking system. The most obvious benefits are that transcription and calculational errors have been eliminated and that there are no longer mistakes where decisions are made based on numerical comparisons. The need for a data clerk to enter the final data into a separate database has been eliminated. There is no longer a need to transfer hard copies of the data packages from a controlled radiological area to an uncontrolled area.

Personnel who participated in the phased testing of the system and provided feedback to the programmer became partners in the development and improvement of the system (see Figure 2). Their involvement resulted in a vastly improved product that enhanced the system and in many cases caused personnel to rethink the way they had been performing work. Personnel who use the system frequently say that this part of their job has become a lot easier and less time-consuming.

Contributors to this project are **Kathryn Smith, Andrew Montoya, Ronald Wieneke, Dennis Wulff, Chester A. Smith, Jr., and Kathleen Gruetzmacher,** all of NMT-7.

LANL Evaluates Commercial Mobile Nondestructive Assay Systems

Before it can be disposed of, nuclear waste must be accurately characterized to identify and quantify its radioactive content. Once it is characterized, appropriate measures can be taken to reduce the radioactive hazard it poses to the public. One of the most cost-effective approaches for characterizing radioactive waste is through the use of nondestructive assay (NDA) instrumentation, which provides quantitative determinations on the isotopes of interest using the characteristic radiation they emit. Such radiation includes but is not limited to gamma rays, neutrons, and heat. Validating the performance of waste assay methods such as NDA is critical to establishing the credibility of the assay results that will be used in choosing storage and disposal methods.

Figure 2: Two commercial mobile assay systems are being evaluated at LANL. These two NDA instruments are in the Canberra Industries trailer.

The DOE Carlsbad Area Office (DOE/CAO) is responsible for qualifying waste characterization equipment associated with the WIPP repository. Qualified equipment is then allowed to characterize waste destined for WIPP. Tests outlined in this article are part of the efforts to qualify such equipment. Under the Performance Demonstration Program (PDP), part of the overall qualification program, both radioactive standards and 55-gallon drums of various matrices to hold the standards have been provided to each site in the DOE Nuclear Weapons Complex. Nondestructive assay systems are then tested semiannually to determine if they meet the quality assurance objectives for precision and bias under the program.

Because the NDA capability at various radioactive waste-generator and waste-storage sites is limited, a number of NDA equipment suppliers have installed their equipment in mobile trailers that could travel around to such sites. To date, no commercial mobile assay systems have participated in the PDP tests because DOE/CAO is still in the early stages of determining how such systems should participate and because it currently lacks a site to test mobile NDA trailers. The manufacturers of these trailers (who have made substantial investments of resources) must quickly demonstrate their capabilities, validate their equipment, and urge DOE/CAO to allow mobile NDA trailers to participate in the program.

The LANL Plutonium Facility is uniquely qualified to test this equipment. We have a broad spectrum of plutonium standards that are traceable to the National Institute of Standards. This includes over fifty 239Pu standards in a wide range of geometries, ranging from 0.2 mg to 480 g. The TA-55 site also has locations where manufacturers of mobile NDA systems can power their trailers and take advantage of realistic test conditions. Having manufacturers come here also eliminates the need to transport radioactive samples for their use.

Two mobile systems, one from Canberra Industries, Inc. (Figure 2), and one from Pajarito Scientific Corporation (Figures 3 and 4), were installed at the LANL Plutonium Facility in August and November of 1996, respectively. The Canberra trailer has two passive NDA systems. One is a segmented gamma scanner waste assay system, and the other is a neutron coincidence counter, waste drum assay system with add-a-source correction (a neutron interrogation technique that corrects for the effects of the waste matrix on neutrons). Both the scanner and counter were pioneered at LANL by the Nonproliferation and International Security Division (NIS). The Pajarito Scientific Corporation trailer has both an active differential die-away technique and a passive multiplicity counter (both developed by NIS). The die-away technique actively interrogates items using thermal neutrons. For both trailers, plutonium isotope compositions are determined from measurements using the MGA (multigroup analysis) code pioneered by Lawrence Livermore National Laboratory.

Los Alamos provides peer review of the performance of the systems for plutonium, acts as a beta-test site to evaluate the waste assay software, and provides data for potential "pre-certification" for future installations—which would minimize the measurements required to qualify the systems for use at other sites. After instruments are calibrated by the manufacturers, assays determine bias, precision, and minimum detectable activity. A performance demonstration test has been conducted to measure the systems against the DOE/CAO quality assurance objectives. Finally, the performance is evaluated for representative waste types at TA-55 (salts, metal, combustibles, leaded rubber, and HEPA filters). Although analysis of test results is still in progress, data from these tests have pointed out areas requiring modifications by the manufacturers. This effort has clearly demonstrated how essential it is to use plutonium, rather than other radioactive sources, for testing.

The LANL Plutonium Facility benefits from these tests on a number of levels. First, they help fulfill the mission of the DOE Defense Programs Office's designated "User Facility/Technology Development Center" at TA-55 for the testing of NDA assay instrumentation. The LANL NDA laboratory equipment in the Plutonium Facility is currently in building areas with high gamma and neutron background levels. With the new focus on measurements of low-level waste, the facility is interested in quantifying any benefits from assay systems located outside of the plutonium facility's high background radiation levels. The trailers will help with this assessment.

Second, one of the most difficult aspects of NDA measurements is the measurement uncertainties associated with waste. This is particularly true when calibration and measurement control standards for NDA instrumentation do not match the matrix of the waste being generated. By bringing in independent instruments, such as the Canberra and Pajarito trailer instruments, and measuring a wide range of actual facility waste, LANL can make consistency checks between the trailer instruments and those of the Plutonium Facility's NDA Laboratory.

Figure 3: An imaging passive/active neutron counter in the Pajarito Scientific Corp. trailer.

A third benefit is increasingly experienced and knowledgeable Los Alamos technicians, considered a key element in the Laboratory's ability to provide cost-effective and high-quality research. With the trailer manufacturers' request to provide beta-testing of the software interface, the LANL Plutonium Facility chose to have Canberra and Pajarito train LANL technicians to operate the equipment (see Figure 4). Technicians thus became intimately involved, and the process resulted in a fair and practical evaluation performed by those who normally operate this equipment on a routine basis. Finally, the current effort has demonstrated the Plutonium Facility's capability to provide a test site for mobile assay systems.

Figure 4: Keith Lash operates the Pajarito Scientific Corp. console.

Contributors to this project include: **M. Schanfein, C. Bonner, R. Maez, J. Martinez, M. Padilla, D. Vigil,** NMT-4; and **L. Tichnor,** TSA-1.

Publications, Presentations, and Reports (January 1997–March 1997)

Journal Publications

D. G. Kolman, D. K. Ford, D. P. Butt, and T. O. Nelson, "Corrosion of 304 Stainless Steel Exposed to Nitric Acid-Chloride Environments," to be published in *Corrosion Science*, 1997 (see article in this issue).

J. C. Martz and J. M. Haschke, "A Mechanism for Combustive Heating and Explosive Dispersal of Plutonium," submitted to *Journal of Alloys and Compounds*, March 1997.

J. M. Haschke and J. C. Martz, "Oxidation Kinetics of Plutonium in Air from 500 to 3500 °C: Application to Source Terms for Dispersal," submitted to *Journal of Alloys and Compounds*, March 1997.

D. G. Kolman and D. P. Butt, "Corrosion Behavior of a $SiC/Al_2O_3/Al$ Composite Material Exposed to Chloride Environments," submitted to *Journal of the Electrochemical Society*, January 1997.

Conference Presentations

D. G. Kolman, D. K. Ford, D. P. Butt, and T. O. Nelson, "Corrosion of 304 Stainless Steel Exposed to Nitric Acid-Chloride Environments," Proceedings of CORROSION '97, National Association of Corrosion Engineers, Houston, TX, March 1997.

J. J. Park and D. L. Jacobson (Arizona State University), "Steady State Creep Rates of Tungsten-4 W/O Rhenium-0.32 W/O Hafnium Carbide," 1997 TMS Annual Meeting and Exhibition, Orlando, FL, February 9–13, 1997.

J. Foropoulos, Jr., "A Simple and Efficient Destruction Process for Volatile Halocarbons," The Thirteenth Winter Fluorine Conference, St. Petersburg Beach, FL, January 19–24, 1997.

L. D. Schulte, G. L. Silver, J. Espinoza, E. M. Foltyn, G. H. Rinehart, L. R. Avens, and G. D. Jarvinen, "Development Program to Recycle and Purify Plutonium-238 Fuel from Scrap," Proceedings of the 1997 Space Technology & Applications International Forum (STAIF-97), Albuquerque, NM, January 26–30, 1997.

G. D. Jarvinen and B. F. Smith, "Water-Soluble Chelating Polymers for Removal of Actinides from Waste Waters," Efficient Separations and Processing Crosscutting Program Technical Exchange Meeting, Gaithersburg, MD, January 28–30, 1997.

S. D. McKee and M. Seitz (DOE/EM66), "Research and Development for Stabilization of Nuclear Materials for the DOE Complex," Fourth Annual International Policy Forum: Management and Disposition of Nuclear Weapons Materials, Lansdowne, VA, Feb. 11-14, 1977.

Reports

T. W. Latimer, "Milliwatt Generator Project, April 1988–September 1996," Los Alamos National Laboratory report LA-13258-PR, March 1997.

Division Review Poster Papers

The following posters were presented at the NMT Science and Technology Assessment, Los Alamos, NM, March 17–19, 1997: S. J. Spach and J. Morgan, "Pit Surveillance Reporting Techniques"; T. H. Allen, C. L. Radosevich, M. Ramos, and J. A. Telford, "Full-Scale Test Facility and Supporting R&D Efforts"; D. C. Huerta and K. M. Axler, "Solid-State Bonding Technology in Pit Manufacture"; P. D. Kleinschmidt, A. R. Berry, D. J. Lujan, and R. A. Salazar, "Pit Atmospheres: Laser Sampling and Radiolytic Effects"; J. M. Haschke and T. H. Allen, "Plutonium Corrosion Reactions: Fundamental R&D Studies"; J. M. Haschke, J. M. Williams, R. E. Pruner, II, D. J. Lujan, and P. C. Lopez, "Fluid Carbon Dioxide Cleaning: Implementation and Supporting R&D"; M. R. Miller, "Plutonium Manufacturing Development"; R. L. Page, J. J. Park, R. J. Martinez, and R. A. Pereyra, "Metallographic Analysis and Other Evaluation Techniques for Surveillance of Pits"; S. D. Soderquist, K. M. Vigil, and T. H. Abeyta, "Gravity Casting of Plutonium Alloy Shapes in Ambient Temperature Molds"; J. P. Baiardo, C. Heiple, and P. V. Wright, "Acoustic Resonance Spectroscopy of Pits"; D. M. Jarboe, J. P. Baiardo, D. M. Chavez, and L. E. Cox, J. D. LeMay (Lawrence Livermore National Laboratory), G. L. Powell (Oak Ridge National Laboratory), W. Moddeman, J. Birkbeck, and K. Coleman (Pantex Plant), "Interagency Collaboration for Development of Staging Safety Diagnostics: Characterization of Residues on Pit Exteriors"; B. Cort, A. C. Lawson, J. A. Roberts, R. J. Martinez, F. A. Vigil, P. W. Watson, R. I. Sheldon, E. M. Foltyn, T. G. Zocco, R. B. Von Dreele, and J. Richardson (Argonne National Laboratory), "Neutron Diffraction Studies of Actinide Metals and Alloys"; P. K. Benicewicz, D. A. Cremers, and J. S. Morris, "Development of a System for Endoscopic Imaging and Spectroscopy of Pit Interiors";

E. D. McCormick, "$^{238}PuO_2$ Oxide Powder Fuel Processing Operations"; R. W. Mathews, L. R. Rodriguez, and T. G. George, "Packaging for Shipment of 62-W General-Purpose Heat Sources for the Cassini Mission"; M. A. H. Reimus, T. G. George, M. W. Moyer (Oak Ridge National Laboratory), C. M. Lynch, M. D. Padilla, and P. F. Moniz, "Ultrasonic Inspection of General-Purpose Heat Source Girth Welds"; M. S. Blau, "Levitation Zone Refining of Plutonium Metal"; M. A. Williamson, F. Venneri, and N. Li, "Accelerator-Driven Transmutation of Waste: Chemistry and Separations"; J. Y. Huang and D. R. Spearing, "Zircon as a Ceramic Host for Plutonium Disposition"; D. K. Veirs, C. R. Heiple (Consultant), G. M. Rosenblatt (Lawrence Berkeley National Laboratory), and J. P. Baiardo, "Measuring Gas Composition and Pressure within Sealed Containers Using Acousitc Resonance Spectroscopy"; J. M. Berg, R. B. Vaughn, M. R. Cisneros, D. K. Veirs, and C. A. Smith, "Spectroscopic Determination of Plutonium (IV) Complexation by Nitrate, Chloride, and Fluoride in High-Ionic Strength Aqeous Solutions"; W. C. Ward, H. E. Martinez, C. L. Abeyta, A. N. Morgan, and T. O. Nelson, "Determination of Plutonium and Americium Contamination on Highly Enriched Uranium Surfaces Using Alpha Spectroscopy"; D. E. Wedman, J. L. Lugo, T. O. Nelson, V. L. Trujillo, K. R. Weisbrod, and H. E. Martinez, "*In Situ* Electrolytic Decontamination of Gloveboxes"; L. A. Worl, D. D. Padilla, S. J. Buelow, L. A. Le, and J. H. Roberts, "Hydrothermal Oxidation for the Treatment of Combustibles"; and L. D. Schulte, S. D. McKee, and R. R. Salazar, "Large-Scale Demonstration of Actinide Decontamination from Concentrated Hydrochloric Acid Waste Streams."

Plutonium Futures
The Science

Santa Fe, NM, on August 25–27, 1997. Conference information is available by visiting the World Wide Web at http://www.lanl.gov/PuConf97, sending e-mail to puconf97@lanl.gov, or calling 505-667-8663.

The NMT Division Review Committee is composed of the following 11 members including one ex officio member:

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NewsMakers

LDRD News

The Laboratory-Directed Research and Development (LDRD) proposals season is upon us. There are basically three components, Competency Development (CD), Program Development (PD), and Individual Projects (IP), in the LDRD program. The due dates for proposals for these are staggered in order to allow maximum preparation time for individual researchers and sponsoring organizations. The CD proposals were due March 21, and the approximate due dates for PD and IP proposals are mid-June and mid-May, respectively.

For fiscal year 1998, the CD component was significantly enhanced, and it represents now almost 50% of the program budget. The CD proposals are generally large in scope, funded at levels up to about $1M annually, and supported multidivisionally. Each Laboratory technical division is allowed to submit a maximum of three "thrust" proposals that it views as most strategic and innovative for the Laboratory's core competency development.

This year NMT Division evaluated a total of six CD thrust proposals and submitted the three top-ranked proposals for further screening reviews by the appropriate program offices and the core competency teams. The three NMT Division-endorsed proposals are as follows: (These proposals have multiple investigators. The names in parenthesis after each proposal are the proposals' spokespersons.)

1. A New Paradigm in Separations: Molecular Recognition Membranes **(Gordon Jarvinen)**
2. Plutonium Aging: Investigation of Changes in Weapons Alloys as a Function of Time **(Joseph Martz)**
3. Direct Numerical Simulation of Microstructural Evolution in Metals **(Janine Fales and Bryan Lally).**

Announcement of thrust proposal winners will be made on May 16, 1997.

Ph.D. Degrees

NMT's abundant talents—Two individuals became the latest from TA-55 to receive their Ph.D. degrees. **Steve Yarbro** received his Ph.D. in chemical engineering; his dissertation was titled "Modeling Interfacial Area Transport in Multi-Fluid Systems." **Joel Williams** received his Ph.D., also in chemical engineering. Williams' dissertation was on "Prediction of Heat of Melting and Heat Capacity of Inorganic Liquids by the Method of Group Contributions." These individuals are part of the Distance Learning Program, which is a cooperative arrangement between the Laboratory and the Department of Chemical Engineering at New Mexico State University. Congratulations to both of you!

ARQ Kudo

The Actinide Research Quarterly has been recognized by the Kachina (NM) Chapter of the Society for Technical Communication with an "Award of Excellence" in the publications category. Designer **Susan Carlson** and writer-editor **Ann Mauzy** were named in the award.

TA 55

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We would like to hear from our readers. If you have any comments, suggestions, or contributions, you may contact us by phone, by mail, or on e-mail (kck@lanl.gov). ARQ is now on the Web also. See this issue as well as back issues on-line (http://www.lanl.gov/Internal/organizations/divisions/NMT/nmtdo/AQarchive/AQindex/AQindex.html).