THE OPERATIONAL STATUS OF WIPP

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ABSTRACT

The Waste Isolation Pilot Plant (WIPP), a waste facility for the disposal of defense generated transuranic (TRU) waste, is almost structurally complete. The WIPP, located in southeastern New Mexico, is managed and operated by the Waste Isolation Division of the Westinghouse Electric Corporation for the U.S. Department of Energy. The plant is presently undergoing startup testing, including operational demonstrations of waste handling equipment and processes.

The current status of WIPP's waste handling capacity, constraints, and plans are of major interest to the waste community, due to the significant technological advances of the Project. Information gained through the operation of the plant will be invaluable, since both the commercial and defense implications of the WIPP waste management programs are far-reaching in terms of future radioactive waste disposal.

This paper provides the latest WIPP construction status, operational plans, start-up schedule, and significant findings. The capabilities and constraints of WIPP waste handling and storage are discussed in detail, and topics involving WIPP preparation for waste receipt in October 1988 (including the waste handler training and qualification program) are also addressed.

INTRODUCTION

The WIPP Project consists of both surface and underground facilities, including a maintenance support and waste handling building, an exhaust and filter building, a technical support building, a security building, various support structures, three shafts to the underground area, underground openings at a single level for waste disposal and experiments, and underground maintenance shops. The operating functions of the WIPP involve surface facilities and underground areas designed for the emplacement of radioactive waste.

Complete responsibility for the Operations program of the WIPP facility begins with turnover by the DOE. For some portions of the facility, responsibility begins with assignment of beneficial occupancy. For other portions, full completion of the construction package must occur before responsibility is assigned. Operating personnel are trained and all necessary procedures prepared before Westinghouse receives the responsibility assignment. Based on vendor, contract, or specified engineering program requirements, preoperational tests are scheduled for post-turnover performance. Upon the successful verification of operability, the facility is released for normal operation.

OPERATIONS PHILOSOPHIES

Planning for WIPP operations is based on the concept of "Success through Excellence," with safety and top quality factors paramount. All operating tasks are conducted in a manner consistent with the intent of effective DOE orders, established policies, and procedures emphasizing the safety and protection of operating personnel, the public, and the environment.

The major operating philosophy of the Waste Handling Program is "Start Clean, Stay Clean." In the event that contamination occurs, waste handling operations will be discontinued in the contaminated area, and that area will be thoroughly decontaminated to clean limits before operations resume. This ensures that the Waste Handling Building (WHB), the waste storage rooms, and general areas are clean and thus do not require anti-contamination clothing for access. This policy also ensures that any isolated contamination occurrence will be prevented from spreading throughout the facility. The underground ventilation system is designed to limit the air exchange from the waste handling area into the mining area, which minimizes the possibility of excavation activities becoming contaminated in the event of an accidental waste container breach.

Another philosophy implemented within WIPP Operations involves a step progression worker system. This system allows for job responsibilities to increase, as justified by experience and training. Junior or entry-level persons progress in the system as their proficiency grows. Senior-level technicians are qualified to operate the RH emplacement apparatus and the hot cell manipulators; in turn, they train lower level technicians to use such advanced equipment. This approach encourages longevity, provides job enrichment and growth potential, and reduces manpower turnover.

Prior to initiation, all maintenance work, excavation, and construction work in areas under the cognizance of operating personnel must be formally approved. Supervisory personnel responsible for surface or underground operations ensure these activities are performed on the specified equipment/systems, and that specified equipment/systems are placed in a safe configuration for such activities.

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Supervisory personnel are the only employes cognizant of any maintenance, excavation, and construction activities in their areas, and are solely aware of the integrated effect of removing equipment from service at a particular time.

Two important goals of the WIPP Operations are to (1) minimize personnel exposures; and (2) reduce fatigue and boredom due to the repetitive nature of routine work. To accomplish both of these goals, the waste handling work force is extensively trained to allow interchangeability at all workstations. This also serves to enhance the availability of trained personnel without overstaffing, taking into account vacations, sickness, and other factors contributing to absenteeism.

TRAINING

Policy dictates that personnel performing operational functions be trained and provided with instructions or procedures to perform their jobs in a safe, efficient, and excellent manner. Training and specified procedures are viewed at WIPP as tools to be utilized by employes to achieve these goals in a minimum amount of time. Operating personnel are expected to continually find new and better ways to perform their tasks; these efforts will be reflected in revised training and procedures. The involvement of supervisory personnel and appropriate supporting organizations such as Engineering, Safety, and Quality Control is essential to ensure that new ideas are properly developed prior to implementation.

An extensive training program at WIPP has been designed to teach waste handling technicians how to handle waste efficiently and safely. Waste handling technicians learn basic information through overview courses, receiving equipment and on-the-job training. Operator qualification cards on individual pieces of equipment are required for each technician. The Training Section maintains equipment qualification cards, and processes certification cards for all waste handling technicians, to ensure that technicians are capable of safely performing their tasks. Waste handling technicians are kept under instruction while performing on-the-job training. Once certified on a certain process, waste handlers are given more independence and sometimes assigned the task of teaching a new waste handling technician. Requalification/recertification is required at varying intervals, according to subject matter.

INSTRUCTIONAL PHILOSOPHY

The training program at the WIPP is based on the systematic approach to training philosophy known as Instructional Systems Design (ISD). ISD is a five phase approach to quality training. The specific phases of ISD are ANALYSIS, DESIGN, DEVELOPMENT, IMPLEMENTATION, and EVALUATION.

ANALYSIS: The job is analyzed so as to determine training needs, which are then correlated to job performance standards. Example input resources for ANALYSIS are experienced employes, procedures, and regulatory documents.

DESIGN: Performance-based learning objectives are developed. These learning objectives form the skill and knowledge requirements for the position for which training is being conducted.

DEVELOPMENT: Instructional activities are developed which lead to the satisfactory accomplishment of the learning objectives.

IMPLEMENTATION: Instructional activities are conducted.

EVALUATION: Evaluation is conducted continuously during the process; most feedback is received after the training has occurred. Sources of feedback include the trainees, supervisors, and changes to equipment, procedures, or regulations.

ISD Application to WIPP Waste Handler Operator Training

Since WIPP is a first-of-a-kind facility, little experience is immediately available to help develop the waste handler operator training program. However, an advisory committee of seven people--with related experience ranging from nuclear power plant operations to uranium mining--analyzed the job requirements of waste handler operator at WIPP and created an in-depth training program.

Once the basic program was designed by the committee, the actual development of the program was a project-wide endeavor encompassing the efforts of five MOC departments and twelve MOC sections. Total development time exceeded one year.

The program was implemented in September 1986 for an initial group of five waste handler operators and engineers. While the initial program is still in progress, evaluation of the program so far has led to some revision. For example, it was determined that the hoist and rigging training needs to be WIPP specific. A committee of hoist and rigging users has been formed to revise hoist and rigging training.

WIPP Waste Handler Operator Training Program

The waste handler operator training program is basically a two phase program. The first phase, Basic Waste Handler Operator Training, is designed to give trainees background information necessary for the safe and efficient accomplishment of their duties. Trainees study facility design, waste acceptance criteria, consultation and cooperation agreements, industrial safety and waste handling procedures, and other related topics. During this phase, trainees also become qualified radiation workers, 6-ton forklift operators, and basic riggers.

Basic Waste Handler Operator Training lasts five weeks and is exclusively dedicated to educating the participants. Lectures, video tapes, and practical exercises are utilized as instructional techniques, and a weekly exam is given to monitor each trainee's progress. Extensive on-the-job practical demonstrations are also part of this instructional phase.

The second phase of the WIPP Waste Handler Operator Training Program involves the specific equipment qualifications (Fig. 1). This training is accomplished utilizing the actual equipment. When fully qualified on the required equipment, a waste handler operator will have forty-four specific equipment qualifications.

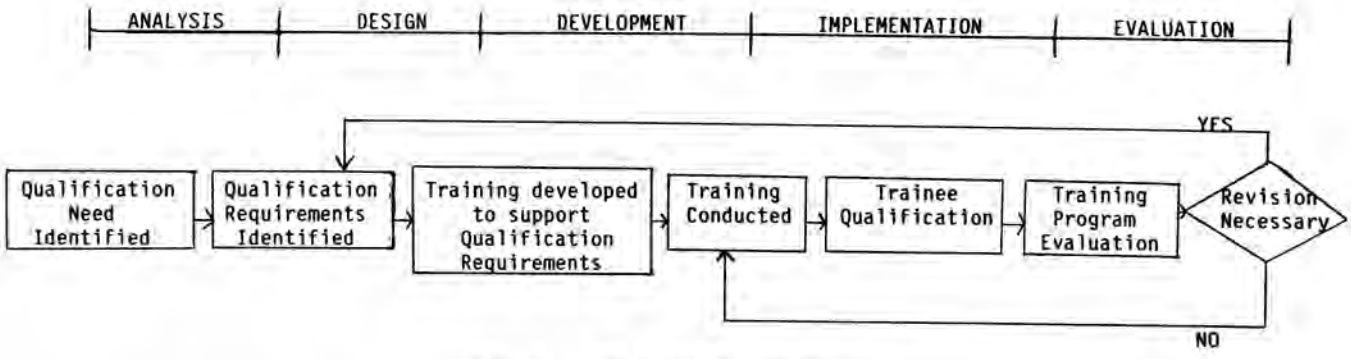

Fig. 1. WIPP Qualification Process.

While this training is designed to train a person with no prior experience to safely and efficiently handle waste at the WIPP, initial trainees were selected with the intention of having them become the primary trainers for subsequent waste handler operator training classes.

WIPP MAINTENANCE

The maintenance program for the WIPP provides the capability to service and maintain all the equipment necessary for operations above and below ground, including radiologically active environments. The degree of attention given to equipment is based on the goals of achieving high reliability, cost effectiveness, minimized radiation exposure and, above all, safety. The maintenance program has been developed around the premise that the key element of any such program is planning.

Planning involves the proper management of personnel resources, equipment, and time, with an appropriate balance of effort devoted to preventive maintenance and equipment repair. Equally important is the establishment and maintenance of an effective equipment historical record keeping system, to ensure the traceability and scheduling of maintenance activities. A maintenance control and scheduling system is being developed to enhance efficient utilization of personnel and equipment, and to help coordinate maintenance tasks with Operations. Strong emphases is placed on training personnel to have a broad range of skills which provide maximum flexibility and cost effectiveness within the organization.

WASTE MANAGEMENT AND THE WIPP WASTE INFORMATION SYSTEM

The Waste Management group at the WIPP is responsible for certification of waste slated to come to the WIPP, and for the development of the WIPP Waste Information System (WWIS). Since waste received at WIPP must meet the Waste Acceptance Criteria, a program was developed to verify that both newly generated waste and waste retrieved from interim storage be certified in a formal manner. Waste Management personnel support this program as part of an audit team that verifies each site's certification program.

WIPP will have a computerized data base for handling all the waste data provided by the shipping sites. The data base has been developed to receive information by electronic mail, on an automated basis, and will have internal edit capability for specified information. Much of the WIPP waste data will be requested by various groups on a routine basis. The WWIS system can tabulate, sum, average, and otherwise process the data to provide the desired reports.

WASTE HANDLING OPERATIONS

Currently, WIPP construction is almost complete (Fig. 2); waste handling equipment and systems are undergoing operational testing and checkout for approval prior to actual waste handling. Mock demonstrations, integrated system checkouts, and subsystem tests are conducted as part of cold waste operations using simulated waste. A report will be generated on each demonstration and system checkout. Each report and demonstration will be reviewed by Westinghouse, DOE, and the EEG. This will provide the basis for documentation of the readiness of the facility, and equipment, to handle actual nuclear waste. Readiness reviews will be conducted prior to start of hot operations.

Began Construction	7/83
Support Building Completed	7/86
Guard and Security Building Completed	3/86
Waste Handling Building Completed	2/87
Exhaust Filter Building Completed	1/87
Underground Development Completed	1/87
Central Monitoring System Completed	3/87
C&SH Shaft Upgrade Forecast Completion	11/87
First Underground Panel Forecast Completion	9/88
Ventilation Shaft Forecast Completion	8/88
Construction Forecast Completion	8/88

Fig. 2. Operations Construction Status.

Initially, most activities occur on a day shift, five days per week, with weekends and backshifts reserved for special activities. After receipt of waste, current plans are for two-shift, five-day-week

operations with waste emplacement on the day shift and excavation work on the later shift. Facility monitoring will then go to three shifts per day, seven days per week, to ensure satisfactory operation of the WIPP facility. Since radioactive waste will be arriving at various times (in various stages of processing), monitoring systems must and will operate on a continuous basis. It is considered prudent to have personnel on hand at all times to take action, if needed, to ensure continued safe operation.

Contact-Handled (CH) Waste

The CH TRU waste system at the WIPP has been designed to receive, unload, transfer (to underground facility storage areas), and emplace the CH waste. During waste handling operations, protection against accidental radionuclide release is accomplished by design redundancy in monitoring systems, equipment, and administrative procedure controls. The system is also capable of performing CH waste retrievals, which will be demonstrated by performing a mock waste retrieval demonstration.

The CH TRU waste throughput used as a basis for designing the CH waste handling system is 500,000 ft^3 (14,200 m^3) per year on a one-shift, 250-day-per-year basis, with about 80 percent (by volume) assumed to be in 55-gallon (208-liter) drums and about 20 percent in steel boxes. Present estimates indicate that waste shipments will be approximately 300,000 ft^3 (8,500 m^3) per year, and present inventories indicate a 50:50 volumetric ratio of drums to boxes.

This volume represents the receival and off-loading of approximately five transuranic package transporters (TRUPACTs) each working day. Detailed time lines were generated for all waste handling functions, in order to identify the limiting case system or piece of equipment. Each limiting case, such as opening TRUPACTs or underground transportation, was eliminated by procuring additional equipment, automating, or improving the process--as done with the TRUPACT automated door opening and closing system. This optimizing process continued until the limiting factor was the waste hoist, which has a throughput rate of 7.5 TRUPACTs per day.

Remote-Handled (RH) Waste

During the demonstration phase, up to 60 canisters per year of RH TRU will be shipped to the WIPP; once the WIPP is fully operational up to 250 canisters per year will be shipped. The WIPP receives RH TRU in a shipping cask containing a single canister, designed and certified as a Department of Transportation (DOT) Type B container. The cask is designated as a truck cask because its weight (50,000 lb) allows overhighway trucking without overweight permits. The truck cask would also be used if RH TRU is retrieved and removed from the site.

The WIPP has the capability to store--on a surge or interim basis--up to six normal RH canisters and one overpack canister in the canister shuttle car located in the basement of the hot cell. In addition, four RH canisters may be stored inside the hot cell, if needed. This flexibility allows WIPP to receive RH waste by road cask, off-load the casks, and return them for additional shipments without having to emplace each canister as it arrives. In this manner, the WIPP can effectively receive a specified amount of waste, with minimal impact to manpower, emplacing the canisters as time and manpower allow.

The WIPP waste handling staff, consisting of 16 waste handlers and a supervisor, are able to handle specified amounts of CH and RH waste simultaneously. Two of the three CH airlocks in the waste handling building can operate and will handle incoming TRUPACTs containing CH waste and concurrently receive and off-load an RH road cask in the RH portion of the building.

SIGNIFICANT FINDINGS

One of the most valuable lessons learned to date at WIPP is that all equipment and systems which are to be used in the underground need to be thoroughly tested, with operability verified on the surface, prior to underground transport. The downloading process is extremely time consuming and costly to perform, and in many cases involves total equipment disassembly--even cutting the equipment in pieces in order to transfer large items down to the underground. Headroom, lifting capability, and work space are at a premium underground; therefore, underground repairing or replacing inadequate equipment is difficult, costly, and time consuming. Consequently, all equipment is tested and operated on the surface, using exact detail models, before it is transported underground. The exact detail models (and training aids) significantly assist in verifying operability at the WIPP.

Another important benefit results from having experienced Operations personnel available in the early design and construction stages of the Project. Those personnel who have operated similar systems and have experience in repairing or decontaminating equipment can also provide invaluable insight on how such systems or equipment can be designed, and constructed, to maximize operator friendliness, contamination control, and ease of decontamination activities.

SUMMARY

The WIPP continues to stress the importance of quality and safety in all aspects of the Project. In preparing for the successful operation of the WIPP, a great deal of thoroughness has been used to ensure that all applicable requirements specified by MSHA, OSHA, DOE Orders, and NQA-1 are satisfied. The WIPP will be ready to receive its first waste in October 1988. The WIPP will be equipped with a well-trained and qualified staff, thorough and verified operating procedures, and the firm determination to prove that the long-term disposal of nuclear waste can be performed in a safe, efficient, and environmentally acceptable manner.