

## OPERATIONAL READINESS REVIEW FOR THE TSCA INCINERATOR START-UP AT THE OAK RIDGE K-25 SITE

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### ABSTRACT

The Department of Energy (DOE) Toxic Substances Control Act (TSCA) incinerator at Oak Ridge K-25 Site was designed in the early 1980's as a treatment alternative for the increasing quantities of radioactive mixed waste accumulating from gaseous diffusion plant (GDP) operations. The waste feed principally contains low assay uranium and PCBs, although listed solvents and heavy metal containing sludges have also been incinerated. Construction was completed in 1986 and the unit underwent an extensive series of tests and trial burns, because of the following unique characteristics:

- the incinerator treats radioactive mixed wastes
- increased size of the incinerator for greater waste throughput and treatment capacity
- expansion of the waste acceptance criteria to include materials and radionuclides from non-GDP operations, such as ORNL and Y-12
- modifications and improvement to the Air Pollution Control (APC) system
- treatment of large quantities and concentrations of PCB containing materials
  
- projected longevity of operation (40 years)
- humid, Eastern location with a high, annual precipitation

The incinerator was initially fired in July, 1986. The full performance testing (with the APC) and DOE acceptance of the facility occurred a year later. The trial burn period lasted from 1988 through 1990. Numerous equipment problems were initially encountered, including excessive draft fan wear and failure. These problems have been overcome, the facility is fully permitted, DOE provided authorization for full operations in 1991, and, to date, over two million pounds of mixed waste have been incinerated, with an average volume reduction factor of approximately nine.

This paper discusses the Office of Environmental Restoration and Waste Management Readiness Review for the incinerator.

### INTRODUCTION

The TSCA Incinerator at the K-25 Plant in Oak Ridge, Tennessee is designed to destroy uranium contaminated PCB wastes and hazardous organic materials. It can handle three types of wastes: liquids (waste oils, solvents, water solutions), solids (solids, absorbent, biological material), and sludge. From November 1989 to April 1991 an operational readiness review (ORR) of the TSCA Incinerator was conducted. The approach taken was a four-phase process, requiring acceptance of phase completion and authorization to proceed to the next phase. The first three phases assessed the readiness to perform preoperational testing: Phase 1 - testing on auxiliary feed, Phase 2 - testing with surrogate and selected waste, and Phase 3 - conducting the State Air Test. The fourth phase was to ensure effective management of the facility to safely and effectively incinerate mixed waste during full routine operations. The readiness review process utilized in-depth readiness criteria, verification of documented item closure, and an independent judging of adequacy of criteria closure by multi-

ple teams and boards. Five groups were involved in assessing the readiness:

1. the Martin Marietta Energy Systems (MMES) Operational Readiness team (ORT),
2. the MMES Readiness Review Board (RRB),
3. the DOE-Oak Ridge Field Office (ORFO) Restart team, and
4. the ORFO Management team, and
5. the Environmental Management (EM) Headquarters team.

The ORT was an MMES management-appointed multi-disciplined group (8 members) that was established to:

1. prepare the readiness review plan for the incinerator,
2. prepare the readiness criteria (standards by which the TSCA Incinerator will be judged ready for operation) for each phase of the process,
3. identify and verify the existence of objective evidence that the criteria were satisfied, and

4. present to the RRB on the state of the incinerator's readiness to begin operation.

The 5-member RRB, consisting of MMES upper management independent of TSCA Operations, was established to:

1. Approve the readiness review plan and criteria,
2. review the verification date, and
3. provide executive-level conclusions and recommendations regarding the readiness of the TSCA Incinerator.

The ORFO Restart Team, composed of 7 staff members from different DOE divisions, was responsible for the following actions:

1. contribute to the development of the readiness criteria,
2. confirm adequate closure of the criteria, and
3. reporting to the DOE Management Team on the incinerator's readiness.

The DOE Management Team:

1. approved the readiness review plan and criteria,
2. judged the adequacy of the criteria closures, and
3. gave the final approval and authorization to go forward for the first two phases, and made recommendations to EM on readiness for the last two phases.

The EM Team, composed of 12 members from EM, other Headquarters offices, and support contractors, was responsible for the following:

1. assessing the ORFO and MMES readiness review process
2. evaluating the status and operability of the facility
3. recommending the final start up decision and required action to EM-1.

The balance of this paper discusses the EM Team readiness review process.

### EM READINESS REVIEW

EM conducted a readiness review prior to the performance of the State air test, in compliance with the intent of SEN-16, "Approval for Restart of Facilities Shut Down for Safety Reason and for Start-up of Major New Facilities." The air test constituted a major milestone in the progress toward full incinerator operations. The review was implemented by using criteria derived from general waste operations criteria, the prior ORFO and MMES reviews, and from the experience and expertise of the EM team members. Although the EM review was originally intended to be the last review prior to the air test, it was, in fact, completed prior to the other reviews.

Subsequently, EM conducted a second review to assess the operational readiness of the incinerator prior to initiation of full operations. This review was implemented by re-examining the air test review criteria and by adding operations-related criteria developed by the review team members. The criteria emphasized breadth across a wide range of items, with selected criteria reviewed in considerable detail because of the history of the facility. The EM criteria and the ORFO/MMES criteria were different but did overlap in some areas. This ensured independent review and added to the overall completeness of the reviews.

The EM was intended to be the final review for a facility prior to initiating full operations. However, as with the air test, the EM review was completed prior to the completion of the MMES and ORFO reviews.

The TSCA Incinerator was successfully restarted in April 1991 and has treated more than two million pounds of contaminated liquids. The operation is in full compliance with both the Toxic Substances Control Act (TSCA) and the Resources Conservation and Recovery Act (RCRA).

### APPROACH

#### Review Plan

The EM ORR was initiated with a plan. The plan's overall objective involved evaluation of the performance, operation, safety, environmental, and regulatory attributes of the incinerator. The plan consists of six elements:

1. Team Formation
2. Generation of a specific checklist
3. Inspection of MMES and ORFO reviews
4. Site Visits and document reviews
5. Analysis, Evaluation, and closure of the checklist
6. Generation of Action Items, Recommendations, and Report

#### Team Formation

Starting up a treatment process system such as the TSCA Incinerator and ensuring that it is successful involves many factors and people. Technical experts, in a variety of fields, are needed to review and assess in a systematic way the issues of conduct of operations, safety documentation, procedures adequacy, personnel training, environmental compliance and permits status, configuration, management, and document control.

The EM team was led by a senior EM program manager with the knowledge and experience necessary to assess the planned operation. The Team Leader identified technical staff including DOE personnel, Management and Operation (M&O) contractors, individual consultants and Technical Support Contractors. Since the EM goal was to have readiness determinations based on adequate, graded assessments that would withstand scrutiny by oversight groups both within (e.g., Office of Environmental, Safety and Health (EH), Office of Nuclear Safety (ONS)) and outside DOE, (e.g., Defense Nuclear Facilities Safety Board (DNFSB), the appointment of a Team Leader and the selection of Team members was crucial for success. The ORR Team totaled twelve people. Background information was provided to the team prior to arrival at the incinerator.

#### Review Process

For the TSCA Incinerator, 221 review questions from the Team Technical Experts were compiled. These questions were divided into five sections:

1. Management, Oversight, and General Approach
2. Process Design
3. Process Operation, Conduct of Operations and Quality Control
4. Safety Issues and Documentation
5. Environmental Effects and Compliance

To facilitate an in-depth review, the EM Team divided into subgroups similar to the groups from MMES and ORFO. With the coordination of the ORFO, sub-groups stayed at different locations for detailed reviews.

The EM Team was free to review any related documents and information. The review activities included:

1. inspection of ORFO/MMES readiness reviews
2. plant tours
3. control room and operation log reviews
4. walk down of procedures
5. Review of the closure process and verification of items
6. Audit of training records and manuals.

Three separate visits to the facility occurred over a six week period, and included an initial kick-off meeting (two days), the main review (five days), and a subsequent procedure review (two days).

Some subgroups visited the site early in the morning and late at night to audit the readiness of the operating crews on different shifts.

Some review questions were re-phrased or re-directed because of new data and observations. At the end of each day, the EM Team Leader debriefed the Team to share their progress, experience, concerns, and to plan activities for the next day.

#### EXIT MEETING

Since review, verification, answer preparation, and other activities were carried out simultaneously by each subgroup, the Team Leader was able to assess the overall readiness of the startup quite accurately at the end of the ORR review period. The EM Team held an exit briefing with the Management of the Field Office and the Management Contractor. The EM Team briefed Leo Duffy upon its return and prepared the review report with recommendations based on its Findings.

#### REPORT PREPARATION

For TSCA Incinerator startup, preparing the report was a major task. Of the 221 review questions on the TSCA Incinerator start-up checklist, the EM Team listed 97 findings which remained open and required corrective action. These were divided into four categories according to their level of seriousness:

1. Those requiring immediate resolution. (5)
2. Those requiring resolution prior to production operation. (54)
3. Those requiring resolution three months after restart. (9)
4. Those requiring resolutions six months after restart. (29)

The open findings covered broad topics and included:

- Documentation Inadequacies: such as management sign-off's, FSAR, and OSR's.
- Procedures and QA/QC: such as missing steps and diagrams, lack of sign-off's and verifications, equipment labeling, and inspections.
- Design, Planning, and Operation: such as facility weatherization, feed system improvements, and availability.
- ES and H: such as ash handling and disposition, contamination control, and emissions monitoring.
- Resolution of known concerns: such as the fan problems, particulates, and lightening effects.

ORFO and MMES were provided with draft copies of the report, and they continued to make progress and close findings while the ORR report was being completed. Consequently, 26 findings were closed within three months after the site visits, and sufficient progress was made on the remaining 71 findings to allow startup of operations. The remaining items concern improvements in operations and are still being closed.

Mr. Duffy approved the restart under the following conditions:

1. Major issues in the findings are resolved in a satisfactory manner.
2. The "Declaration of Readiness for Operation" was received from the DOE Field Office Manager (ORFO).

#### OBSERVATIONS OF THE ORR PROCESS

Overall, the EM ORR of the TSCA incinerator has had a very positive effect upon the facility and its operation. Specific, beneficial items include:

1. The review was independent and identified findings and activities that were either overlooked or were prematurely closed by the ORFO and MMES reviews.
2. The ORR identified recommendations and actions to close findings, and, thus, provided solutions.
3. The EM ORR recognized that all findings did not require immediate resolution, and, hence, the recommendations could be phased in with a schedule.
4. The Team and "area expert" approach, with assigned responsibilities and checklist areas, worked very well.
5. The EM preplanning and checklist generation prior to the site visit saved considerable time and effort. It provided a structure for all (EM, ORFO, and MMES) to follow, and allowed the facility staff to initiate responses and actions on the checklist findings.

Improvements could be made in the following areas:

1. The readiness reviews by ORFO and MMES were not essentially completed prior to the EM ORR. This delayed inspection and verification by EM.
2. The level of documentation and checklist closure requirements were not determined at the initiation of the ORR. It must be recognized that these requirements may change and should evolve during an ORR, but an initial set of criteria for comparison would have maintained focus and expediency. It must also be recognized that a facility and organization will attempt to meet the minimum requirements, and, thus, the ORR team also had to follow the spirit and implementation of the closure criteria by the incinerator staff.
3. Closure of ORR items has taken much longer than expected. The initial, active ORR took five months of elapsed time to close the findings required for full operation. It is expected that closure of the remaining findings will not be completed until 1993.

Major issues covered by the ORR in the review were:

- Adequacy of safety documentation,
- Adequacy of procedures,
- Training of personnel,
- Conduct of Operations implementation,
- Readiness of support organizations,

- Document control /configuration management,
- Status of environmental permits,
- Adequacy of equipment/systems,
- Adequacy of design/requirements,
- Adequacy of management: Process and Approvals.

### LESSONS LEARNED

The following items are recommended for Future Readiness Reviews

1. Define the scope of the review and adhere to that scope as much as possible throughout the project. However, do not hesitate to change the scope if the checklist findings necessitate it.
2. A phased approach to readiness reviews, with each phase tied to key milestones of the project, is recommended for complex starts or restarts, where possible.
3. The Project RRB and DOE (both the site office and HQ) should be involved from the very beginning in the development of the plan, criteria, and in determining appropriate closure documentation and validation. The goal should be one set of criteria established at the beginning of the process, and an up-front understanding of what constitutes closure.
4. Closure of readiness criteria must be documented so that it is auditable and should be verified by physical inspection. Members must also go to the facility to spot check evidence. Contractor and DOE ORR teams should work together in developing the criteria and verifying the closures.
5. The project is accountable for activities performed by support organizations and, therefore, these groups or facilities should be included in the ORR.
6. Formal status tracking and reporting of criteria closure and established schedules for completing and inspecting closure of items help to avoid oversights and surprises. The tracking system should be auditable to ensure process credibility. Usually, monthly reports and updates suffice.
7. It must be recognized that assignment to a readiness review team is full time during the actual review period and may require part-time activities before and after the review period. Supervising managers must be willing to adjust work priorities to allow staff commitment to the review. If possible, formal assignment to the review team should be made and recognized.
8. Lessons learned from other facilities should be reviewed prior to initiating readiness reviews. In addition, after each readiness review, the lessons learned should be documented.
9. The EM Team should not start the review process until the reviews for both a DOE Field Office and its Contractor are essentially completed.
10. The participation of the DOE oversight groups (e.g.,EH) early in the process is important. For a complicated startup process, a cohesive team approach is necessary for success.
11. The Project or facility should perform self-assessments and obtain independent reviews prior to initiating the formal readiness review process.
12. The review should not be schedule driven, but it is important not to let it be drawn out. This can happen

by continually adding new criteria, or not having a predetermined definition of what constitutes closure of each item, but it should be flexible enough to incorporate not addressed, partially addressed, or new pertinent criteria.

13. The review team should be made up of members whose expertise, as an overall team, must cover all of the expected aspects of the review.
14. The major issues listed on page 7 will more than likely be critical items in the readiness process and should, therefore, be addressed early in the process.
15. It must be recognized that the front line personnel hold the key to restart and continued successful operations; particularly through their willingness to make changes, suggestions for ways to improve, etc. Therefore, they must be involved from the beginning of all new project initiatives and changes.
16. Frequent communications between the Project Management and DOE is needed to help minimize duplicate reviews, coordinate actions, and streamline the approval process.

The ORR for the K-25 TSCA Incinerator startup presented a challenge to EM-30. The existing DOE Order and directives did not provide clear guidance for the process and requirement for readiness determinations. DOE Order 5480.5 defines ORR as "a structural method for determining that a project, process or facility is ready to operate and occupy and includes, as a minimum, review of the readiness of the plant and hardware, personnel, and procedures. The review includes a determination of compliance with ES&H Order." The Order does not specify who should conduct the ORR or what approach should be used. The revised SEN-16B-91 requires Mr. Duffy's approval for selected restarts and major nuclear facility restart or startup and calls for the ORR to be performed by both DOE and Managing Contractors, but there is no guidance on how to proceed.

The approach outlined above provides a logical and effective way to determine the readiness of a planned operation. The efforts and the level of details required for a DOE ORR need to be appropriately graded to (1) the planned mission, (2) the complexity of the planned operation and (3) the associated risk.

### REFERENCES

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4. "Draft EM Policy and Guidance for Readiness Determination," Office of Environmental Quality Assurance and Quality Control (EM-20), U. S. Department of Energy, Washington, D.C., January 14, 1992.