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JUST-IN-TIME CHARACTERIZATION AND CERTIFICATION OF DOE-GENERATED WASTES

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ABSTRACT

The goal of just-in-time characterization and certification, which is based on the just-in-time manufacturing process, is to streamline the certification process by eliminating redundant layers of oversight and establishing pro-active waste management controls. Just-in-time characterization and certification would rely on a waste management system in which wastes are characterized at the point of generation, precertified as they are generated (i.e., without iterative inspections and tests subsequent to generation and storage), and certified at the point of shipment, ideally the loading dock of the building from which the wastes are generated. Waste storage would be limited to accumulating containers for cost-efficient transportation.

Just-in-time characterization and certification would be accomplished by establishing three new job positions, the waste characterizer, the waste precertifier, and the waste shipment certifier. The waste characterizer would participate in the planning process for a project, taking samples and providing input as needed; he or she would also be available to address questions raised during generation, packaging, and precertification of the wastes. The precertifier would be responsible for the detailed review of the waste documentation to ensure compliance with the disposal site waste acceptance criteria. The waste shipment certifier would perform the final review of the waste documentation and would prepare the shipping papers (e.g., manifests) necessary for the waste shipment.

Just-in-time characterization and certification is most applicable to wastes generated by decontamination and decommissioning activities. However, to introduce the concept at the facility and train employees, other waste categories (e.g., environmental restoration waste, rejected waste, legacy waste, newly generated waste) can be used in a phased approach.

INTRODUCTION

Transportation and disposal of wastes generated by Department of Energy (DOE) activities, including weapons production and decontamination and decommissioning (D&D) of facilities, require that wastes be certified as complying with various regulations and requirements. These certification requirements are typically summarized by disposal sites in their specific waste acceptance criteria. Although a large volume of DOE wastes have been generated by past activities and are presently in storage awaiting disposal, a significant volume of DOE wastes, particularly from D&D projects, have not yet been generated. To prepare DOE-generated wastes for disposal in an efficient manner, it is suggested that a program of just-in-time characterization and certification be adopted.

The concept of just-in-time characterization and certification is based on established just-in-time manufacturing practices, in which goods are produced as needed to fill customers' orders; parts and product inventories, and the storage needs for these inventories, are minimized to reduce costs. The linchpin of just-in-time manufacturing is quick and dependable response to customer needs. The key to successful just-in-time characterization and certification is confidence derived from an effective characterization and waste management system, and the resultant ability to certify wastes as they are processed (i.e., without iterative inspections and tests subsequent to generation and storage).

The following description of the just-in-time characterization and certification concept is based on an evaluation of the waste certification program at the Rocky Flats Environmental Technology Site (RFETS) and experience at other DOE facilities, including the Los Alamos National Laboratory (LANL).

REGULATORY DRIVERS AND THE NEED FOR JUST-IN-TIME CHARACTERIZATION AND CERTIFICATION

Requirements for waste certification are derived from DOE Order 5820.2A (1), 10 CFR Part 71 (2), 40 CFR Part 191 (3), and 49 CFR Part 172 (4). These specifications require waste generators to assure waste treatment, storage, and disposal facilities that established waste acceptance criteria (WAC) are met. This assurance includes the implementation of the controls and measures necessary to ensure compliance with the WAC. Certification requirements are also present in the waste acceptance criteria for various disposal facilities, as follows:

- Envirocare of Utah, *Material Acceptance Process Manual* (5)
- Hanford Site, *Hanford Site Solid Waste Acceptance Criteria* (6)
- Nevada Test Site, *Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements* (7)
- Scientific Ecology Group (SEG), *Waste Acceptance Criteria* (8)
- Waste Isolation Pilot Plant, *Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (9)

The specific certification requirements for DOE, U.S. Environmental Protection Agency (EPA), U.S. Department of Transportation (DOT), and different treatment, storage, and disposal facilities can, at some DOE facilities, result in multiple layers of oversight (Figure 1). In turn, these multiple layers of oversight may increase the amount of bureaucracy, time and resources (i.e., personnel and budget) needed to get a waste shipment offsite, reducing efficiency and increasing costs. The goal of just-in-time characterization and certification is to streamline the waste characterization and certification processes. This can be accomplished by eliminating redundant levels of oversight and establishing pro-active controls rather than "final inspection quality" to achieve WAC compliance.

JUST-IN-TIME CONCEPT

The basic concepts inherent to the just-in-time operational management philosophy have application at DOE facilities. The goals of just-in-time manufacturing are to reduce costs, increase efficiency, and increase the company's responsiveness to its customers. Eliminating overhead in the form of parts inventories, product inventories, and storage requirements associated with these inventories, reduces

Infrastructure Controls

Waste management program approval by the waste certification official and disposal facilities

Ongoing review and approval of implementing procedures

Verification Measures

Inspection of containers and control of nonconforming items

Audit/surveillance by internal and external organizations

Trending of nonconformance reports and corrective actions

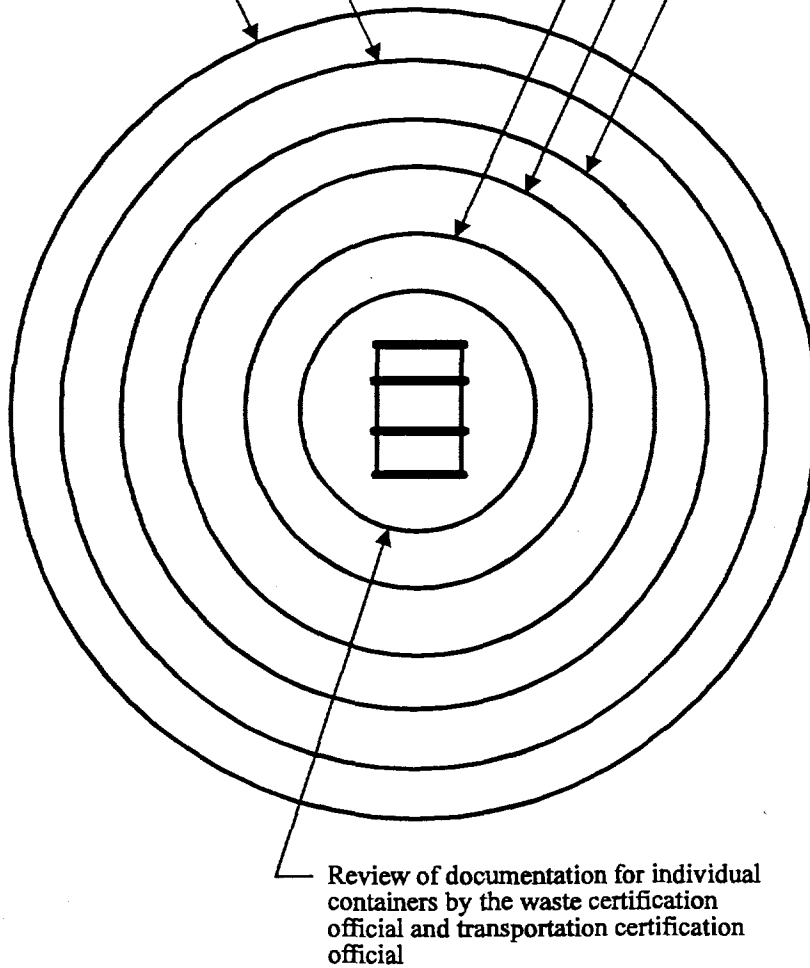


Figure 1. Potential Layers of Oversight in the Waste Certification Process

costs; in addition, process bottlenecks can be identified and corrected. Manufacturing products at the rate of demand improves efficiency of the process can be improved. Because the products are manufactured at the same rate as demand, the time required for responding to shifting customer demands can be reduced.

These concepts can be applied to waste characterization and certification at DOE facilities. Rather than storing waste until it is ready to be shipped and incurring costs (e.g., inspections, utilities, building floor space) associated with this storage, the just-in-time process would ship wastes immediately after generation. In addition to reducing or eliminating storage costs, this process would enable DOE facilities to meet changing waste acceptance criteria as the wastes are generated, not as the packages are pulled from storage, which results in higher costs and delays in shipping because of the rework of the packages to meet the new acceptance criteria.

JUST-IN-TIME CHARACTERIZATION AND CERTIFICATION

Just-in-time characterization and certification at DOE facilities would allow wastes to be shipped from the generation location and eliminate the need for long term storage. Wastes would be stored only for the purpose of accumulating enough waste packages to make shipment economically viable. Both characterization and certification would be required at or near the point of generation.

For characterization to support the just-in-time concept, the waste generated by an environmental restoration (ER) or D&D project must be characterized (i.e., sampled and analyzed as necessary, with complete analytical results) before the wastes are placed into containers. This requires the characterization personnel to participate during the planning stages of a project. As the responsible manager and engineers are planning the process for performing the project, the characterization personnel would be reviewing the planning documents, designing the sampling plan, and performing initial sampling of materials that would be generated as wastes during the project. Initial sampling conducted during the planning stages of the project could also be applicable to the validation of process knowledge for future ER and D&D activities. During the actual performance of the project, waste characterization personnel must be available, on an on-call basis, to provide characterization of unknown or unanticipated waste items.

Wastes generated by the project would be certified at the point of shipment, similar to what currently occurs at many facilities. However, the wastes would be precertified at the point of generation, with the final certification of the waste packages replacing what is sometimes referred to as dock inspection. This final certification would be primarily a review of the necessary documentation to ensure that the it is properly and completely filled out. The detailed review of information contained in the shipment documentation would be performed during precertification of the package, before the container is sealed, and while the generator is still directly responsible for the package.

PERSONNEL REQUIREMENTS

The adoption of just-in-time characterization and certification may require the realignment of several existing job positions. In addition to the waste generator, just-in-time characterization and certification would require three positions: the waste characterizer, the waste precertifier, and the waste shipment certifier. These positions are described in the following paragraphs.

The detailed development of the organizational structure where these positions would exist is beyond the scope of this evaluation; however, two general guidelines are required. To provide for funding independent of the building (in the case of D&D) or operable unit (in the case of ER), funding for these positions would be provided by the facility management contractor. To ensure the autonomy of these organizations and to avoid questions of interest conflict, the activities performed by these positions would be audited by an organization independent of both the characterization and certification organization and the building or area generating the waste.

Waste Characterizer

To provide for just-in-time characterization, the personnel responsible for this characterization must be available to the personnel generating and precertifying the waste. These characterization personnel must also be present at the planning stages of the project, as described previously. These personnel would attest to the proper characterization of the waste being placed into the container and be available to provide guidance when sampling unknown or suspicious wastes as they are encountered by the personnel performing the waste generating activity. Guidance on the proper packaging of the wastes being generated would also be available from these personnel.

Waste Precertifier

Under just-in-time certification, the waste shipment certifier would be limited primarily to reviewing documentation completeness. The detailed review of the container documentation would need to be performed during the process of waste generation; although the waste precertifier's duties would be similar to that of a waste inspector performing in-process inspection of a waste package, the level of detail for which the package would be inspected is greater. This detailed review would be performed by the waste precertifier.

The waste precertifier would control access to the waste packages; ensure the proper setup of the container for the waste stream being generated (e.g., number and type of liners, presence of a carbon filter); ensure that generators placing waste into the package have current qualifications, and ensure that the wastes placed into the package are of the same, or compatible, waste types. In position and responsibility, the waste precertifier would be analogous to the package certifier described in NVO-325, *Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements* (7).

Waste Shipment Certifier

Because wastes would be shipped from the point of generation, and it is likely that ER and D&D activities would be conducted simultaneously at several locations, the number of personnel required to perform the final certification of waste packages must increase. This position, referred to as the waste shipment certifier, would be responsible for the final certification of the waste packages before shipment.

To perform certification on the increased numbers of packages anticipated from ER and D&D activities, the duties would be a combination of the duties that may currently be performed by certification officials from different departments, such as waste management and transportation. These duties would include not only the certification of the packages, but the preparation of the necessary shipping documents as well. The amount of information and level of detailed review performed during the certification process would be reduced to examining the package documentation for proper completion and signatures.

IMPLEMENTATION

Implementation of the just-in-time concept into a company's operations typically involves five steps. Implementation of these just-in-time concepts in a manufacturing environment can be readily adapted to a service environment, such as waste management and certification, as follows:

- *Cleaning up the Operations.* Factors that prevent the certification and shipment of waste can be identified and eliminated or reduced by performing an evaluation of the existing process for generation and certification of waste and a root cause analysis of problems diagnosed during this process.
- *Effecting a Company-wide Culture Change.* Because DOE facilities are in a period of transition from weapons manufacturing to ER and D&D, a facility-wide culture change might be necessary. This would be an ideal opportunity to introduce the concept of just-in-time waste characterization and certification.
- *Preparing Logistics for Just-in-time.* Procedures and processes for the certification of waste should be reviewed so that unnecessary or redundant requirements are eliminated. Upgrades to existing facilities that are needed for shipping the large amounts of waste expected to result from ER and D&D activities also may be necessary. Areas requiring logistical upgrades should be identified after a more detailed analysis of the facilities has been done.
- *Implementing the Program.* Another aspect of preparing for just-in-time characterization and certification implementation is training personnel to the revised procedures and processes. Characterization, certification, and their associated quality assurance requirements should be pushed as far back in the waste generation process as possible, ideally to the point of generation.
- *Reviewing and Monitoring the System after Implementation.* Specific measurable performance objectives should be established for each department or program that will be contributing to just-in-time characterization and certification.

These steps can be used to implement just-in-time characterization and certification for DOE-generated wastes. Currently, several types of waste are in storage or are being generated at DOE facilities. These waste types include low-level waste, mixed low-level waste, low-level waste with Toxic Substances Control Act-regulated constituents, transuranic waste, transuranic mixed waste, and wastes that are awaiting analytical results before being prior to categorized. These wastes can be placed into one of two broad populations, as follows:

- *Backlog Waste.* This is a general category including several subpopulations of waste:

Rejected—Waste that does not meet the current certification requirements.

Legacy—Waste that was generated before the implementation of a facility-specific waste management system, such as the Waste/Residue Traveler system at RFETS and the Waste Profile Form system at LANL.

Undetermined—These are wastes for which analytical results are not available. As a result, they have not been assigned to a particular waste type (e.g., low-level, low-level mixed, transuranic).

Miscellaneous—These are small waste streams that, because of their nature, cannot be assigned to the other waste categories. Examples of these wastes include sewage sludge and medical waste.

- *Newly Generated.* Wastes that have been generated under the facility waste management system and which have been determined to meet the current certification requirements.^a

The recommendations made in the previous sections may be used to expedite the shipment of these wastes to offsite disposal facilities, such as the Nevada Test Site, Envirocare of Utah, and the Waste Isolation Pilot Plant. Although the following sections describe the implementation of the recommendations, they do not provide the complete details (e.g., procedure modifications, training) required for this implementation.

Rejected Wastes

At some facilities, the criteria that are in place for waste certification may be more strict than the criteria established by the disposal facilities, resulting in the rejection of a large portion of the generated wastes. It is anticipated that a portion of these rejected wastes may be certified through administrative disposition of the reason for rejection. This administrative disposition would use a subject matter expert review of the existing documentation and strict interpretation of the disposal facility waste acceptance criteria. For this to occur, however, flexible interpretation of the present facility certification requirements would be needed.

Legacy and Stored Newly Generated Waste

Certification of both legacy waste and newly generated waste currently in storage at the various facilities could be accomplished using the same interpretive methods as described earlier. In addition, a statistically defensible sampling and analysis plan would be initiated to provide accurate characterization of these wastes, as applicable. This sampling would also be used to validate the results of any backlog waste recharacterization and the existing process knowledge documentation. This sampling program would also be utilized for training the waste characterizers for their future participation in just-in-time characterization.

Undetermined Wastes

Because undetermined wastes are awaiting analytical results before being categorized, the certification of these wastes will depend on their final classification. However, if further sampling is required before the categorization is performed, this sampling may be used as training for the waste characterizers.

^aThese wastes are referred to as certifiable. In many cases, a complete comparison of these waste containers to the facility certification requirements has not yet been performed. Thus, at a later date, some of these containers may be rejected based on a more complete review.

Current Newly Generated Waste

It is recommended that any just-in-time certification process first be established as a pilot program. The intent of this program would be to introduce and develop the concept of just-in-time certification and to provide training for the required personnel (i.e., waste shipment certifiers, waste precertifiers, and waste characterizers). This training would be accomplished by rotating the personnel through the pilot program and then placing them into other waste generating buildings, at which time just-in-time characterization and certification would be implemented. By having such a centralized, hands-on training process, consistency in training could be achieved, personnel motivation enhanced, and lines of communication established. To ensure the certifiability of wastes generated during this pilot program, it is recommended that the waste packages in-process be inspected and certified using the existing certification system on a temporary basis, in parallel to the certification being performed under the just-in-time system.

To further the transition from the current waste generation and certification process to the just-in-time process, and to simplify it, present waste packaging procedures should be reviewed to identify those requirements absolutely necessary for the certification of wastes to the disposal facility WAC. Requirements that are not absolutely required should be eliminated. The procedures themselves should be simplified, combined, and rewritten so that one procedure would provide sufficient information for the proper packaging of waste.

As these procedures are revised, and as the just-in-time process is developed, it is also recommended that the responsibilities of the organizations involved in waste characterization and certification be reviewed and, as necessary, combined so that only those organizations absolutely necessary to the certification process are involved. Responsibilities of the retained organizations, and the lines of communication among those organizations, should also be defined as completely as possible to remove any ambiguity that may confuse or slow the process.

Future Waste Generation

As the present waste generation and certification system is transitioning to a just-in-time process, waste streams will be transitioning from manufacturing and maintenance to complete ER and D&D. It is likely that certain buildings and areas within each facility (e.g., operable units) will be amenable to just-in-time characterization and certification before other buildings and areas. Obviously, it is in these buildings and areas that just-in-time characterization and certification should be established first. Because of the nature of ER activities, many of which are conducted away from facility buildings, it may be possible to implement the just-in-time process most easily in these areas.

The implementation of just-in-time concepts should be performed at a pace dependent on the rate of waste generation. Currently, if wastes are generated at a fairly low rate, the transport of the packages to a centralized location for certification and shipment remains economical. In the future, however, the rate of waste generation within the individual buildings is likely to increase, overwhelming the ability of the present system and the centralized location to adequately certify and ship waste. At this time, when it becomes both economically inviable and logistically impossible to process wastes through this centralized location, the just-in-time characterization and certification process should be instituted. By tracking the time and costs associated with transporting waste packages, processing these packages through the centralized location, and comparing these costs to those estimated for just-in-time certification, the point can be identified at which the just-in-time process becomes practical.

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