e-TRAMPAC Software as a Tool for Transuranic Waste Transportation Compliance Evaluation

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ABSTRACT

Contact-handled transuranic (CH-TRU) waste containers to be shipped to the Waste Isolation Pilot Plant (WIPP) in the Transuranic Package Transporter-II (TRUPACT-II) will be certified according to the requirements in the TRUPACT-II Authorized Methods for Payload Control (TRAMPAC), Revision 19 [1]. Revision 19 of the TRUPACT-II Safety Analysis Report (SAR) implements several payload expansion initiatives ensuring compliance with the U.S. Nuclear Regulatory Commission requirements governing the generation of flammable gas within the payload container.

In conjunction with Revision 19 of the TRUPACT-II SAR, the Automated TRUPACT-II Authorized Methods for Payload Control (e-TRAMPAC), an implementation tool for the Revision 19 initiatives, has been developed for use by CH-TRU waste sites as part of the WIPP Waste Information System (WWIS). e-TRAMPAC performs all compliance evaluations and generates all documentation required by the TRAMPAC.

To facilitate use by the sites, e-TRAMPAC will be integrated into the WWIS. e-TRAMPAC will evaluate containers for transportation compliance at the same time the WWIS is evaluating the containers for compliance with WIPP Waste Acceptance Criteria. The integration with the WWIS will streamline the certification of waste by the sites because it will allow the sites to transmit container data to one centralized location and evaluate the containers for transportation and disposal at the same time.

e-TRAMPAC will provide a browser-based user interface to allow users to create payload assemblies and evaluate the assemblies against TRAMPAC requirements. Users will be able to iteratively add and remove payload and dunnage containers to create a TRAMPAC-compliant assembly. Users can then print the completed transportation certification documents required by the TRAMPAC.

TRANSPORTATION REGULATIONS

Contact-handled transuranic (CH-TRU) waste containers to be shipped to the Waste Isolation Pilot Plant (WIPP) in the Transuranic Package Transporter-II (TRUPACT-II) will be certified according to the requirements in the TRUPACT-II Authorized Methods for Payload Control (TRAMPAC), Revision 19 [1], which was recently approved by the U.S. Nuclear Regulatory Commission.

The TRAMPAC [1] establishes requirements for the following payload container parameters: container type, container weight, criticality, decay heat, gas generation potential, presence and specification of filters, aspiration of previously unvented containers, drum age prior to sampling, nuclide activity, dose rate, and the absence of prohibited items. The TRAMPAC [1] also establishes limits for TRUPACT-II assemblies, including limits on weight, criticality, decay heat, and gas generation potential.

Revision 19 of the TRAMPAC implements several payload expansion initiatives addressing the gas generation issue including [1]:

- The use of dose-dependent gas generation values based on matrix depletion to establish higher decay heat limits.
- The use of a flammability assessment methodology to determine qualification of payload containers with headspace concentrations of flammable volatile organic compounds (FVOC) greater than 500 parts per million (ppm).
- The use of payload container headspace gas measurement to qualify test category waste for shipment.
- The addition of specifications for improved payload container and bag filters to allow higher decay heat limits by taking credit for lower resistance to hydrogen gas release.
- Increased shipping flexibility by mixing of shipping categories within a payload.

Other expansion initiatives provided by TRAMPAC, Revision 19 [1], include:

- Addition of 100-gallon drum as an authorized payload container for direct-load or overpacking applications.
- Addition of shielded pipe components as authorized payload containers for use with high-gamma emitting materials or neutron sources.

NEED FOR e-TRAMPAC

Several of the payload initiatives provided by Revision 19 of the TRAMPAC utilize complex mathematical algorithms with limits dictated by the properties of the assembly of containers chosen for shipment. This necessitated the creation of a computer software capable of evaluating containers for compliance with the TRAMPAC.

One such initiative is the determination of the mixture lower explosive limit (MLEL) for containers with FVOC concentrations greater than 500 ppm at any location inside the container. Revision 18 of the TRAMPAC and previous revisions prohibited shipping

containers in which the FVOC concentration could not be shown to be less than or equal to 500 ppm. In Revision 19 of the TRAMPAC [1], the contributions of individual FVOCs to the total flammability has been identified. For a container with greater than 500 ppm FVOCs, e-TRAMPAC calculates the MLEL to determine the total flammability potential of the container.

The payload expansion initiative using mixing of shipping categories involves another mathematically complex algorithm that necessitated the development of e-TRAMPAC. The shipping category is a parameter that indicates a container's potential for flammable gas generation and release. In previous revisions of the TRAMPAC, all containers shipped in a payload were required to have the same shipping category. In Revision 19 of the TRAMPAC, containers of different shipping categories can be mixed in a payload assembly. This allows containers with high flammable gas generation potential to be shipped with containers with much lower potential taking credit for the difference in potential provided that all other TRAMPAC requirements are met. e-TRAMPAC solves a system of 14 equations with 14 unknowns to calculate the "flammability index" for each container and determine whether the containers selected for a TRUPACT-II payload can be mixed.

WIPP WASTE INFORMATION SYSTEM (WWIS)
The WWIS database is a computerized data management system used by the WIPP to gather, store, and process information pertaining to CH-TRU waste destined for or disposed of at the WIPP. The WWIS supports those organizations who have responsibility for managing CH-TRU waste by collecting information into one source and ensuring that waste container data are complete and in a uniform format for easy evaluation [2].

The WIPP will not accept any waste container shipments for disposal if the waste container information has not been correctly submitted to the WWIS and approved for shipment by the WWIS Data Administrator [2].

Waste container information received by the WWIS is subject to both electronic edit/limit checks and manual inspection by WIPP personnel to ensure that the data representing the waste containers are in compliance with the WIPP Waste Acceptance Criteria (WAC). WIPP personnel make entries to the WWIS after waste containers are received at the WIPP to record information concerning the shipment arrival and the disposal location of each container [2].

The WWIS uses the Oracle database management system that follows ANSI (American National Standards Institute) SQL (structured query language). The database management system is compatible with the majority of existing computer hardware throughout the U.S. Department of Energy complex [2].

e-TRAMPAC/WWIS INTEGRATION

e-TRAMPAC was initially developed as a Visual Basic/Microsoft Access application. This required separate entry of container data into an Access database separate from the required submittal to the WWIS. This application had three modes of operation: tutorial, single container evaluation, and database evaluation. The entire application was user-interactive and allowed the sites to see the step by step compliance evaluation.

It was determined that it would be advantageous to integrate e-TRAMPAC into the WWIS for container evaluation. When integrated, sites will only be required to enter container data into a single database for transportation and disposal compliance evaluation. The WWIS will then be the central storage location for all transportation and disposal data associated with all containers transported to the WIPP.

The e-TRAMPAC consists of two components, Container Evaluation and Payload Assembly. These components were ported into languages compatible with the WWIS UNIX platform.

The Container Evaluation component of e-TRAMPAC will evaluate containers for transportation compliance at the same time the WWIS is evaluating the containers for compliance with WIPP WAC. All container evaluations will be performed without any user interaction. Containers that fail weight, criticality, or activity limits will be rejected from further evaluation. Containers that are found to meet all requirements, excluding those of gas generation, are eligible for inclusion in a Payload Assembly. The gas generation requirements may be met through several methods including the mixing of shipping categories to allow high-flammability potential containers to take credit for being mixed with low-flammability potential containers in a payload.

e-TRAMPAC will provide a browser-based user interface in ASP (Microsoft Active Server Pages) to allow users to create payload assemblies and evaluate the assemblies against TRAMPAC requirements. Users will be able to iteratively add and remove payload and dunnage containers to create a TRAMPAC compliant assembly. Assemblies found to be compliant will be stored in the WWIS. Users can then print the transportation certification documents required by the TRAMPAC.

In order to simplify the work of the site Transportation Certification Official, e-TRAMPAC will generate the container and assembly certification documents required by the TRAMPAC. The e-TRAMPAC Container Evaluation component is called by the WWIS application and is transparent to the user. Containers that pass will appear as eligible containers in the Payload Assembly component. Containers that fail appear on the "Ineligible Containers" report.

SUMMARY

Revision 19 of the TRAMPAC offers several important payload expansion initiatives that will allow sites to ship a much greater portion of their currently stored TRU waste under less restrictive conditions. e-TRAMPAC will provide a simple interface allowing sites to make effective use of these initiatives. The integration of e-TRAMPAC with the WWIS

will provide sites with a single interface for submitting container data prior to shipment of containers to WIPP for disposal.

REFERENCES

[1]   U.S. Department of Energy (DOE), 2001. *TRUPACT-II Authorized Methods for Payload Control*, Safety Analysis Report for the TRUPACT-II Shipping Package, Revision 19, NRC Docket No. 71-9218. U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

[2]   DOE, 1997. *WIPP Waste Information System User's Manual for Use by Shippers/Generators, WWIS Version 4.0*, Revision 2, DOE/CAO-97-2273, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.