Facilitating TRU Waste Transportation Certification Using the e-TRAMPAC Code

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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 generator 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 has been 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 payloads 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 payloads, including limits on weight, criticality, decay heat, and gas generation potential.

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

- The use of dose-dependent G values based on matrix depletion to establish decay heat limits three to five times higher than under Revision 18 for some waste material types.
- 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 volume (ppmv).
- 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 allowing the 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 ppmv 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 ppmv. In Revision 19 of the TRAMPAC [1], the contributions of individual FVOCs to the total flammability has been quantified. For a container with greater than 500 ppmv FVOCs, e-TRAMPAC calculates the MLEL to determine the total flammability potential of the container.

The payload expansion initiative allowing the 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. 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 (FI) 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 relational database management system. Oracle 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.

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

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 the 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 containers with high hydrogen gas generation potential to take credit for being mixed with containers of low hydrogen gas generation 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 TRUPACT-II payloads and evaluate the payloads against TRAMPAC requirements. Users will be able to iteratively add and remove payload and dunnage containers to create a TRAMPAC-compliant assembly. Payloads found to be compliant will be stored in the WWIS.

In order to simplify the work of the site Transportation Certification Official, e-TRAMPAC will generate the container and payload 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.

OPERATION OVERVIEW

The WWIS user submits container data to the WWIS tables prior to the shipment of any container. During the evaluation of submitted containers, the WWIS calls e-TRAMPAC to perform the evaluation of container data against TRAMPAC [1] requirements.

Containers requiring shipping category reassignment will be listed on a report printable from the Payload Assembly application. Containers determined to be compliant with all TRAMPAC [1] requirements except gas generation requirements will then be included on a list of containers from which the user may assemble a payload. Printable Payload Container Transportation Certification Document (PCTCD) may be generated for these containers from the Payload Assembly application.

The user accesses the Payload Assembly application to create assemblies and TRUPACT-II payloads. The Payload Assembly application then evaluates the payload against TRAMPAC [1] requirements. Containers with different shipping categories may be mixed to achieve gas generation compliance or for other purposes (e.g. weight limit compliance). A Payload Assembly Transportation Certification Document (PATCD) will be generated for payloads that pass the evaluation. If a payload fails the evaluation, the user will have the ability to iteratively remove and replace noncompliant payload containers in an attempt to create a TRUPACT-II assembly that complies with all TRAMPAC [1] requirements.

Containers that do not meet TRAMPAC [1] requirements (other than gas generation requirements) will be given a status of "Fail" and will appear on an "Ineligible Containers" report available from the Payload Assembly application. Containers that fail are not available for selection when building TRUPACT-II payloads.

MATHEMATICAL METHODOLOGY FOR CONTAINER EVALUATION

The mathematical models and numerical methods that formed the basis for this software are from TRAMPAC [1], Revision 19. Table I lists the theoretical basis and mathematical models used by e-TRAMPAC V. 2.0 together with the TRAMPAC [1] appendix in which they are explained. Figures 1 through 4 illustrate the container evaluation sequence e-TRAMPAC follows. The following sections describe the mathematical evaluations performed by e-TRAMPAC. The software will provide meaningful error messages if a container fails for any reason.

Table I
Mathematical Methodology Cross-Reference

TRAMPAC [1] Appendix	Mathematical Methodology
5.1	Effective G Values for TRUPACT-II Waste Types
5.2	Matrix Depletion
5.4	Procedure for Determining Numeric Payload Shipping Category
5.5	Derivation of Decay Heat Limits
5.6	Determination of Steady-State (90%) VOC Concentrations from Drum Age Criteria and Prediction Factors Based on Packaging Configurations
5.7	Unified Flammable Gas Test Procedure
5.8	Calculation of Drum Flammable Gas Generation Methods: AltMeth
5.8	Calculation of Flammable Gas/VOC Concentrations: Flammability Assessment Methodology Program (FAMP)
5.9	Determination of Aspiration Times
6.3	Mixing of Shipping Category and Determination of Flammability Index

Completeness of Data

Before using available data for a container, e-TRAMPAC checks the database for completeness. If required information is missing, the container will fail with no path forward.

Waste Type Wattage Limits

e-TRAMPAC verifies compliance with waste type wattage limits in TRAMPAC [1] Table 5.7-2. If the container exceeds the limits, the container will fail with no path forward.

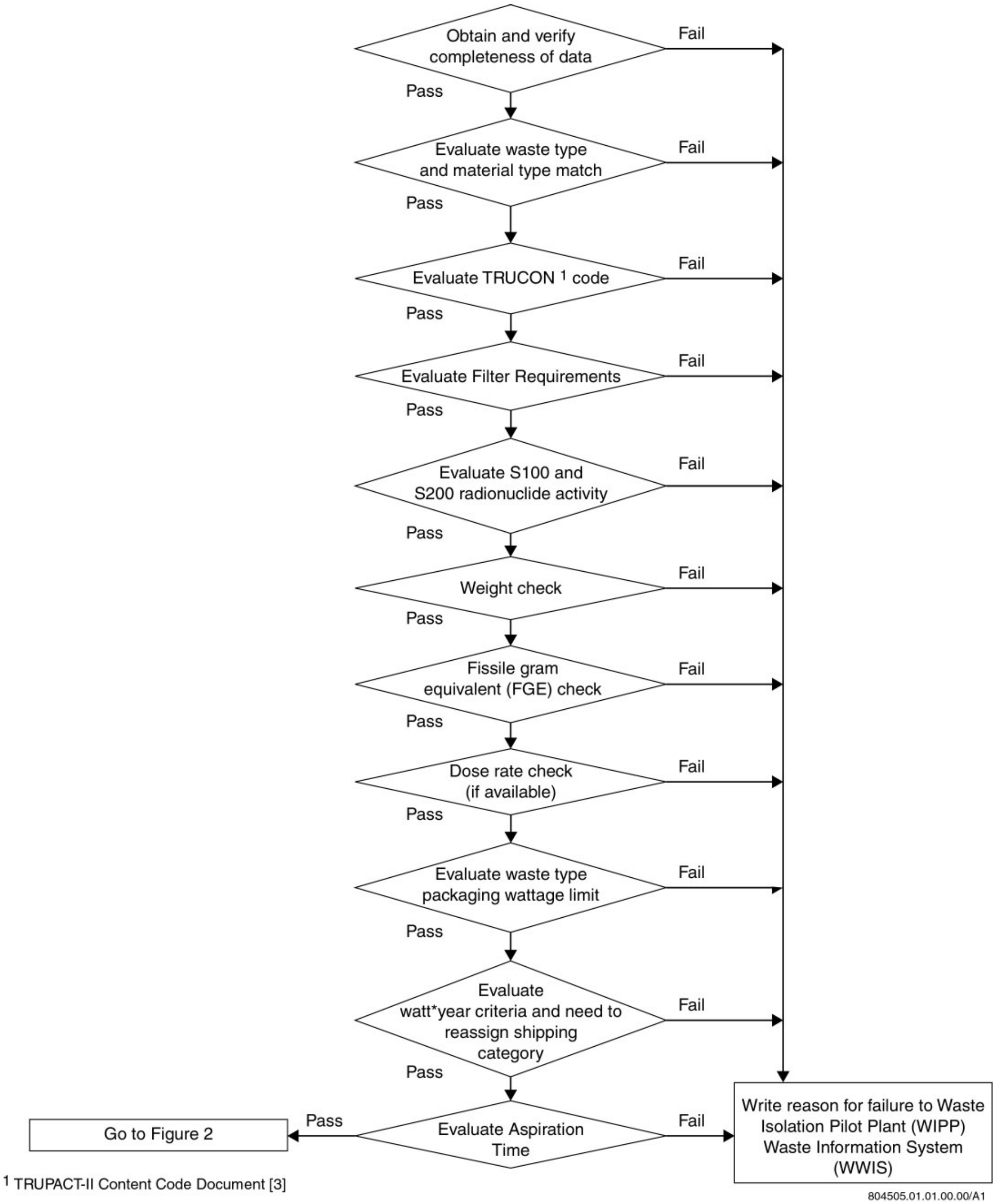


Fig. 1. Logic Diagram for Evaluation of Payload Container Parameters.

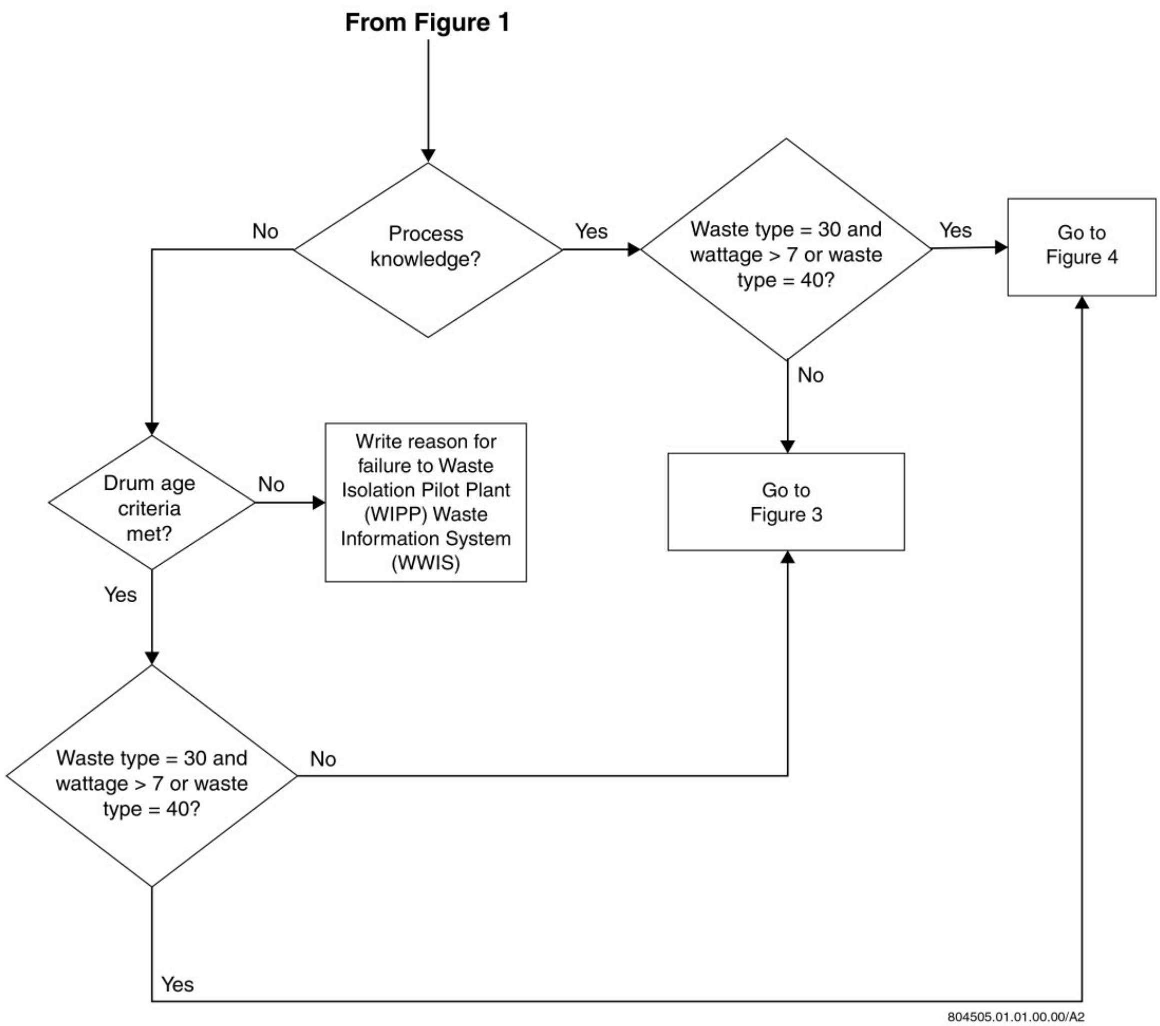
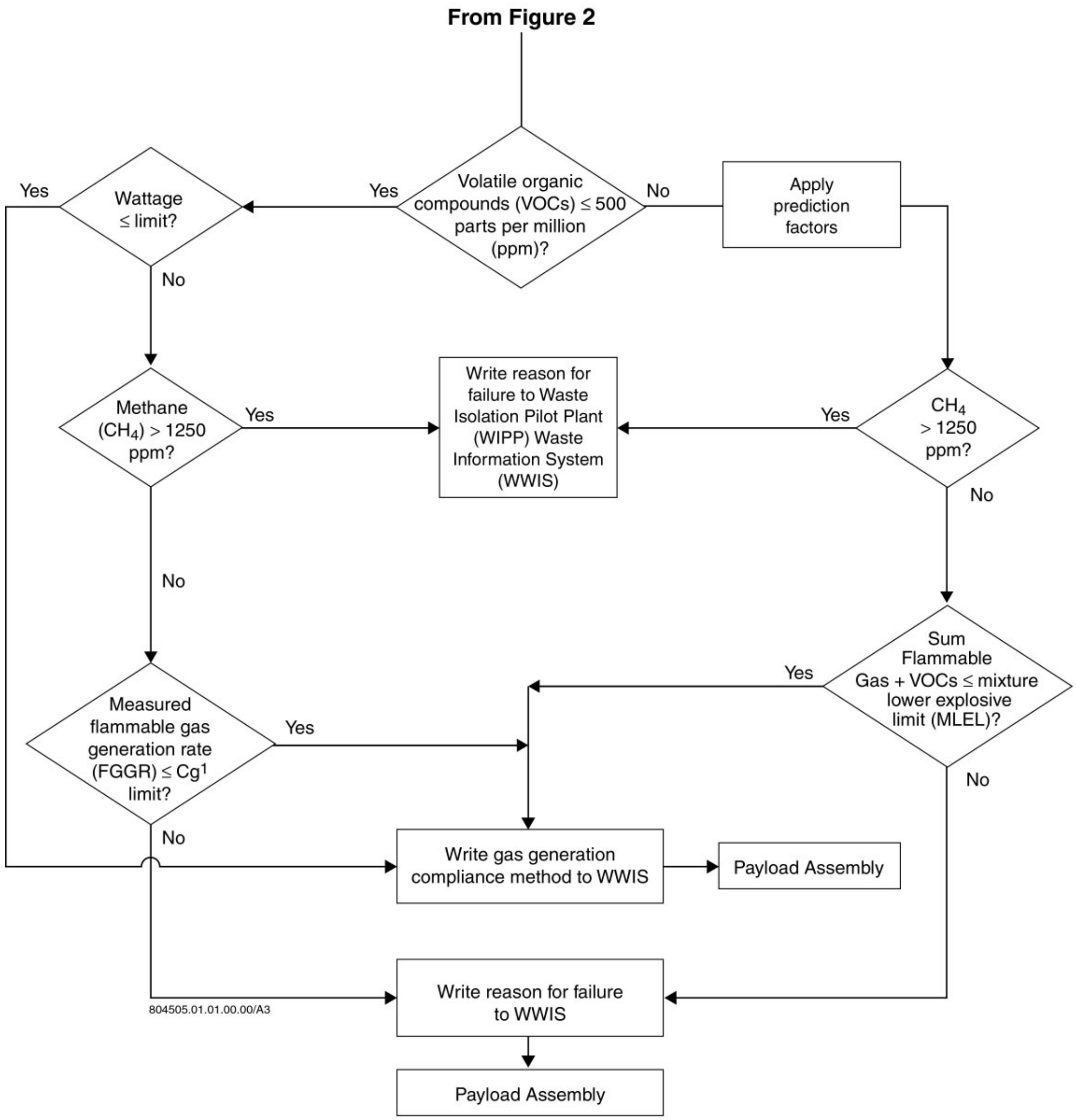


Fig. 2. Logic Diagram for Establishing VOC Concentration



1 Hydrogen gas generation rate per innermost layer of confinement

Fig. 3. Logic Diagram for Gas Generation Compliance

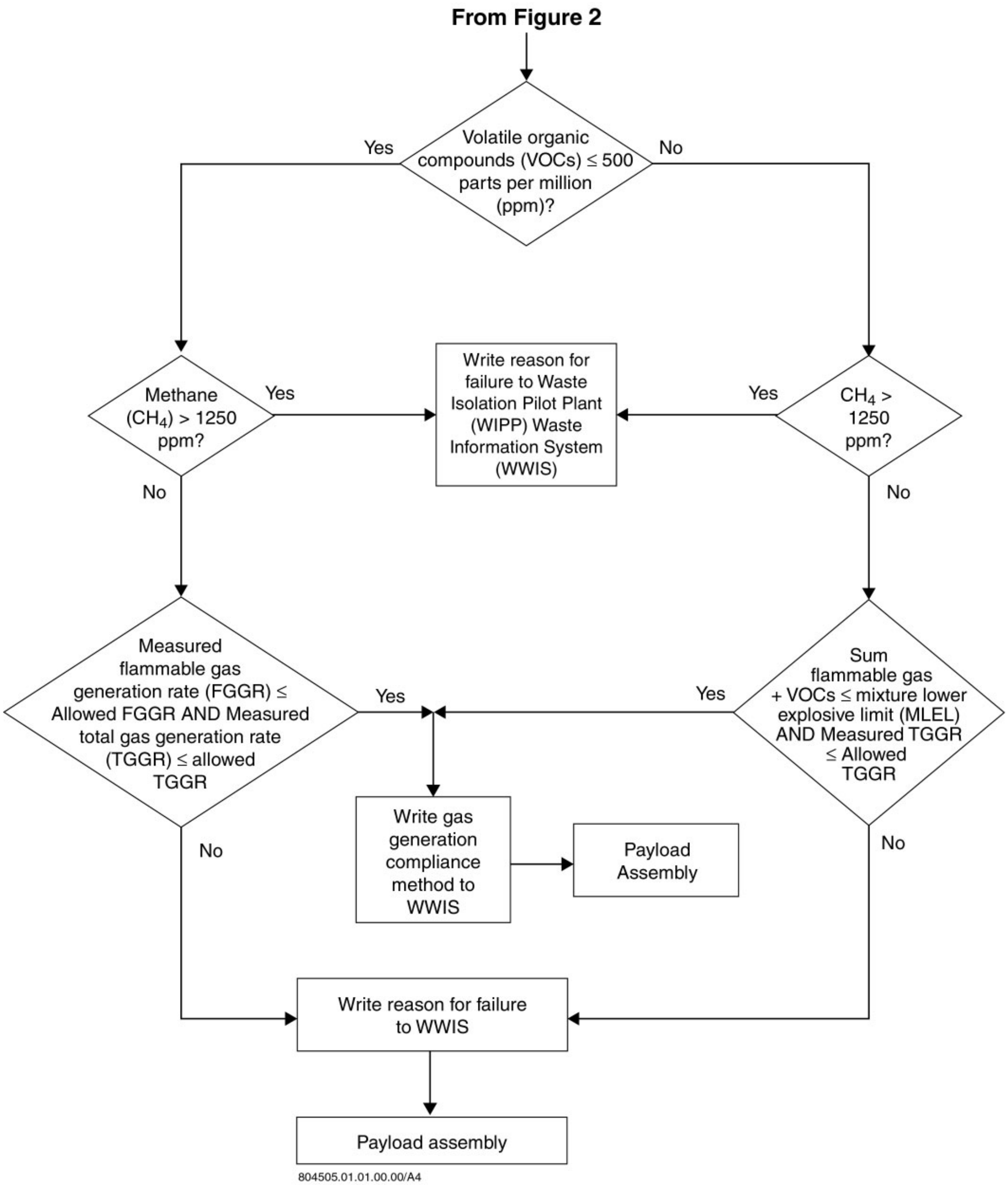


Fig. 4. Logic Diagram for Gas Generation Compliance by Full-Drum Testing

Filter Requirements

e-TRAMPAC verifies that the minimum number of filters is present in accordance with TRAMPAC[1] Table 2.5-1. Table II lists the minimum number of filter vents required by container type.

Table II
Minimum Filter Requirements

Container Type	Minimum Number of Filter Vents
55-Gallon Drum	1
100-Gallon Drum	1
Pipe Component (all)	1
Standard Waste Box	2
Ten Drum Overpack	9

Containers that do not meet the minimum filter requirement will fail with no path forward.

Dose-Dependent G values

e-TRAMPAC will determine whether containers of Waste Type II and Waste Type III meet a watt*year criterion of 0.012 (i.e., the wattage of the waste multiplied by its age in years is greater than 0.012). Containers that meet this criterion and must be assigned a new shipping category based on dose-dependent G values before proceeding. The new shipping category to which the waste must be reassigned is found on the report titled "Containers Requiring New Shipping Category." The user must reassign the shipping category and rerun the software for that container.

Weight

e-TRAMPAC verifies that the container gross weight plus gross weight error complies with container weight limits listed in Table III. Containers that do not meet weight limits will fail with no path forward.

Table III
Container Weight Limits

Container Type	Container Weight Limit
55-Gallon Drum	1000
100-Gallon Drum	1000
Pipe Component (6 in)	328
Pipe Component (12 in)	547
Pipe Component (S100)	650
Pipe Component (S200)	547
Standard Waste Box	4000
Ten Drum Overpack	6700

Nuclear Criticality

e-TRAMPAC verifies that the container fissile gram equivalent (FGE) plus twice the FGE uncertainty complies with container FGE limits listed in Table IV. Containers that do not meet FGE limits will fail with no path forward.

Table IV
Container FGE Limits

Container Type	Container FGE Limit
55-Gallon Drum	200
100-Gallon Drum	200
Pipe Component (6 in)	200
Pipe Component (12 in)	200
Pipe Component (S100)	200
Pipe Component (S200)	200
Standard Waste Box	325
Ten Drum Overpack	325

S100/S200 Activity Evaluation

If the container is an S100 or S200 pipe overpack, e-TRAMPAC verifies that the container meets the radionuclide activity limits specified in TRAMPAC [1] Appendices 2.3 and 2.4. If the container is an S100 pipe overpack and exceeds the TRAMPAC limit of 28 curies (Ci), the container will fail with no path forward. If the container is an S200 pipe overpack and any radionuclide exceeds the limit specified in TRAMPAC [1] Table 2.4-2, the container will fail with no path forward.

Radiation Dose Rates

If dose rate information is provided by the user, e-TRAMPAC evaluates the container to verify that the dose rate is less than or equal to 200 milliroentgen equivalent man per hour (mrem/hr) at the surface. The waste certification program for a particular site may not require the dose rate to be measured until immediately prior to shipping the container. If dose rate information is not provided, e-TRAMPAC does not evaluate the container for compliance with the dose rate limit. Dose rate information is required to be provided to the WWIS prior to shipment.

Valid TRUCON Code/Shipping Category Combinations

e-TRAMPAC verifies that the TRUCON code/shipping category combination for a container is valid in accordance with Revision 13 of the TRUCON [3]. If the TRUCON code/shipping category combination is invalid the container will fail with no path forward.

Decay Heat Limit

If the flammable VOC concentration is known to be less than or equal to 500 ppmv, e-TRAMPAC compares the container wattage to the wattage limit as determined by the container shipping category. This wattage value is determined from TRAMPAC [1] Table 5.5-1 if the shipping category is present in the table or by calculating as described in TRAMPAC [1] Appendix 5.5. If a container does not meet the wattage limits, the container fails, but still may be eligible for payload evaluation.

Drum Age Criteria

Headspace gas measurement for VOCs is required for payload containers for which compliance with the flammable VOC limit of 500 ppmv cannot be ascertained. If there is no process knowledge supporting the absence of VOCs, e-TRAMPAC must have VOC data available. For the VOC data to be valid, e-TRAMPAC must verify that the container meets the drum age criteria (DAC), which are estimates of the time required for VOCs in a drum to reach 90 percent of the equilibrium steady-state concentration within the different layers of confinement. Table V below lists the options for evaluating the DAC. If a container does not meet the DAC under any option, the container will fail with no path forward. The drum headspace concentrations must be measured again when the DAC are met.

Table V
Drum Age Criteria Options

Option	Description
Option 1	No drum age criteria (DAC) required.
Option 2	DAC for common packaging configurations listed in TRAMPAC [1] Table 5.6-2. This option bases the DAC on the elapsed time between drum closure and venting and the elapsed time after drum venting. Under Option 2, there are three scenarios for meeting the DAC as described in TRAMPAC [1], Appendix 5.6.
Option 3	Calculation of steady-state VOC concentrations for specific packaging configurations based on concentration multipliers in TRAMPAC [1], Tables 5.6-8 through 5.6-11. Not used by e-TRAMPAC Version 2.0.

Note the following assumptions e-TRAMPAC V. 2.0 uses when evaluating DAC:

- Packaging configurations 4 through 6 (as defined in TRAMPAC [1] Table 5.6-2) are considered newly generated waste, (i.e., the vent date equals the closure date).
- DAC Option 2, Scenarios 1 and 2 apply only to packaging configurations 1 through 3 in TRAMPAC [1] Table 5.6-2.
- DAC Option 2, Scenario 3 applies to all packaging configurations (1 through 6) in TRAMPAC [1] Table 5.6-2.

Flammable VOC Data

If the container meets any of the DAC options, e-TRAMPAC determines compliance with flammable VOC limits. Flammable VOC concentrations are supplied to the WWIS database by the user. As previously stated, if there is no process knowledge supporting the absence of VOCs, data must be present for at least one VOC.

If the summed total concentration of flammable VOCs in the container is less than or equal to 500 ppmv, the container passes. If the summed total of flammable VOCs is greater than 500 ppmv, the software applies prediction factors to determine the concentration of the innermost layer of confinement, and the container is evaluated for gas generation according to the process described in logic diagrams shown in Figures 1 through 4. If the container fails flammable gas/VOC concentration limits or gas generation requirements, it may be evaluated for compliance under the payload assembly option, wherein, containers of different payload shipping categories or dunnage may be mixed to meet the gas generation limits.

H_2 /CH_4 Measurement

If the flammable VOC concentration is greater than 500 ppmv or the container decay heat is greater than the wattage limit, compliance with gas generation requirements must be determined by flammable gas measurement. The following information is required for H_2/CH_4 Measurement: the location of gas measurement (within drum headspace or rigid liner headspace), the date of measurement, the H_2 concentration (ppmv), and the CH_4 concentration (ppmv). e-TRAMPAC evaluates whether the CH_4 concentration is less than or equal to 1,250 ppmv. If the CH_4 concentration is greater than 1,250 ppmv, the container fails with the reason "Container failed methane concentration limit – mitigate." If the container CH_4 concentration is less than or equal to 1,250 ppmv and flammable VOCs are present in concentrations greater than 500 ppmv, the container may proceed to headspace flammable gas/ VOC measurement. If no VOCs are present, the container may proceed to headspace flammable gas measurement. Drums that can demonstrate compliance with gas generation requirements only through full-drum testing (i.e., Waste Type IV) bypass the headspace flammable gas/ VOC measurement and go directly to 55-Gallon Drum Testing (with or without VOCs).

Headspace Flammable Gas Measurement

The container must undergo headspace flammable gas measurement if the container CH_4 concentration is less than or equal to 1,250 ppmv; flammable VOCs are not present in concentrations greater than 500 ppmv; and the container waste type is I, II, or III and has failed the analytic decay heat limits for its shipping category. The flammable gas generation rate (FGGR) is calculated based on a headspace measurement of the flammable gases (H_2 and CH_4) and compared to the allowable FGGR determined from TRAMPAC [1] Table 5.5-1, if the shipping category is present in the table, or by calculating as described in TRAMPAC [1] Appendix 5.5. If the calculated FGGR is greater than the allowable FGGR and the container is a 55-gallon drum or pipe overpack, the drum proceeds to 55-gallon Drum Testing (no VOCs). If the container is not a 55-gallon drum or pipe overpack, the container fails gas generation requirements.

Headspace Flammable Gas/VOC Measurement

The container must undergo headspace flammable gas/VOC measurement if the container CH_4 concentration is less than or equal to 1,250 ppmv; VOCs are present in concentrations greater than 500 ppmv; and the container waste type is I, II, or III and has failed the analytic decay heat limits. The mixture lower explosive limit (MLEL) is calculated by e-TRAMPAC using the flammable group method. The sum of the flammable gas and flammable VOC concentrations in the innermost confinement layer is calculated and compared to the MLEL. If the sum of flammable gas and VOC concentrations in the innermost confinement layer is greater than the MLEL and if the container is a 55-gallon drum or pipe overpack, the container proceeds to 55-Gallon Drum Testing (with VOCs). If the container is not a 55-gallon drum or pipe overpack, the container fails gas generation requirements.

55-Gallon Drum Testing (no VOCs)

The container is evaluated under 55-gallon drum testing (no VOCs) if the container waste type is IV and the flammable VOC concentration < 500 ppmv. For other waste types, the drum may be evaluated if the drum has failed the analytic decay heat limits and has failed gas generation requirements by headspace flammable gas measurement. If the measured FGGR obtained through 55-gallon drum testing is less than or equal to the allowable flammable gas generation rate, the drum is eligible for payload assembly if all other transportation requirements are met. Compliance with the total gas generation rate (TGGR) is also checked for drums belonging to Waste Type IV or drums belonging to Waste Type III with decay heat greater than 7 and less than 20 watts in accordance with TRAMPACT requirements [1]. Containers failing gas generation requirements can still be shipped if they pass payload assembly requirements when mixed with containers of different payload shipping categories or dunnage containers.

55-Gallon Drum Testing (with VOCs)

The container is evaluated under 55-gallon drum testing (with VOCs) if the container waste type is IV and the flammable VOC concentration > 500 ppmv. For other waste types, this evaluation is conducted if the drum has failed the analytic decay heat limits and the drum has failed gas generation requirements by flammable gas/VOC measurement. The sum of the flammable gas and VOC concentration in the innermost layer is compared to the MLEL. The flammable gas concentration in the innermost confinement layer is calculated based on measured FGGR through 55-gallon drum testing. Compliance with TGGR is also checked for drums belonging to Waste Type IV or drums belonging to Waste Type III with wattage > 7 and less than 20. Containers failing gas generation requirements can still be shipped if they pass payload assembly requirements when mixed with containers of different payload shipping categories or dunnage containers.

Aspiration

e-TRAMPAC evaluates 55-gallon drums for compliance with aspiration requirements. The program reads the aspiration option entered by the User for the container under evaluation and the dates of closure, venting, sampling, and analysis for the container. e-TRAMPAC calculates the number of days the container has been vented, compares the elapsed time to the required vent time from the appropriate TRAMPAC [1] table, and displays the results.

The allowable aspiration options are summarized in Table VI.

Table VI
Aspiration Options

Option	Description
Option 1	Aspiration time based on date of payload container closure.
Option 2A	Headspace gas sampling at time of venting from the container headspace.
Option 2B	Headspace gas sampling at time of venting from the rigid liner headspace
Option 3	Headspace gas sampling after venting during aspiration.

MATHEMATICAL METHODOLOGY FOR PAYLOAD ASSEMBLY EVALUATION

After a container or series of containers is evaluated, the user can go to the Payload Assembly application to create TRAMPAC [1] compliant assemblies, TRUPACT-II payloads, and shipments. The following subsections discuss the evaluations performed by the Payload Assembly application.

Container Type

e-TRAMPAC does not allow mixing of container types within a payload. e-TRAMPAC evaluates the container configuration to ensure that it meets one of the configurations listed in Table VII:

Table VII
Allowable Configurations

Number of Containers	Configuration
14	55-gallon drums
14	Standard pipe overpacks
14	S100 pipe overpacks
14	S200 pipe overpacks
6	100-gallon drums
2	Standard waste boxes (SWB)
1	Ten-Drum Overpack (TDOP)

e-TRAMPAC does not evaluate overpacked configurations at this time. The containers listed in Table VII may not contain inner containers; all containers are direct loaded.

Weight

e-TRAMPAC verifies that the assembly gross weight plus the root mean square (RMS) of the gross weight error complies with TRUPACT-II weight limits. e-TRAMPAC does not allow payloads to exceed 7,000 pounds. The TRAMPAC [1] requires that the TRUPACT-II payload plus pallet, guide tubes, slip sheets, reinforcing plates, and banding material must not exceed 7,265 pounds. Payloads that exceed weight limits will not be allowed.

Center of Gravity

e-TRAMPAC ensures that the heaviest assembly is configured to be the bottom assembly as represented on the PATCD.

Nuclear Criticality

e-TRAMPAC verifies that the total assembly FGE plus the RMS of twice the FGE error complies with the assembly FGE limits shown in Table VIII. Assemblies that exceed FGE limits will not be allowed.

Table VIII
Assembly FGE Limits

Container Type	TRUPACT-II Assembly FGE Limit
55-Gallon Drum	325
100-Gallon Drum	325
Pipe Component (6 in)	2800
Pipe Component (12 in)	2800
Pipe Component (S100)	2800
Pipe Component (S200)	2800
Standard Waste Box	325
Ten Drum Overpack	325

Radiation Dose Rates

e-TRAMPAC does not evaluate the dose rate for the TRUPACT-II.

Gas Generation Requirements

When containers belonging to different payload shipping categories are assembled, the FI is calculated. If the FI of any one container is greater than 50,000 the assembly fails. The assembly must be reconfigured by replacing one or more of the waste containers with a different waste container or dunnage container and recalculating the FIs of each container based on the new configuration.

SUMMARY

Revision 19 of the TRAMPAC provides several important payload expansion initiatives that allow waste generator sites to ship a much greater portion of their TRU waste inventories. 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.