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# ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 610278

| 2. To: (Receiving Organization) | 3. From: (Originating Organization) | 4. Related EDT No.: |
|---|---|---|
| Distribution | Process Control | N/A |
| **5. Proj./Prog./Dept./Div.:** | **6. Design Authority/ Design Agent/Cog. Engr.:** | **7. Purchase Order No.:** |
| Tank 241-S-102/Waste Management/Process Control/ Process Engineering | K. D. Fowler | N/A |
| **8. Originator Remarks:** | | **9. Equip./Component No.:** |
| For release | | N/A |
| | | **10. System/Bldg./Facility:** 241-S-102 |
| **11. Receiver Remarks:** | **11A. Design Baseline Document?** [ ] Yes [X] No | **12. Major Assm. Dwg. No.:** N/A |
| | | **13. Permit/Permit Application No.:** N/A |
| | | **14. Required Response Date:** 02/25/99 |

**15. DATA TRANSMITTED**

| (A) Item No. | (B) Document/Drawing No. | (C) Sheet No. | (D) Rev. No. | (E) Title or Description of Data Transmitted | (F) Approval Desig-nator | (G) Reason for Trans-mittal | (H) Origi-nator Dispo-sition | (I) Receiv-er Dispo-sition |
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| 1 | HNF-4095 | N/A | 0 | Organic End State Analysis of Tank 241-S-102 | N/A | 2 | 1 | 1 |
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**16. KEY**

| Approval Designator (F) | Reason for Transmittal (G) | Disposition (H) & (I) |
|---|---|---|
| E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7) | 1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required) | 1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged |

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|---|---|---|---|---|---|
| | | Design Authority | | | |
| | | Design Agent | | | |
| 2 | 1 | Cog.Eng. K.D. Fowler [signature] 2/25/99 R2-11 | | | |
| 1 | 1 | Cog. Mgr. N.W. Kirch [signature] 3/1/99 R2-11 | | | |
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| K.D. Fowler [signature] 2/25/99 | N/A | N.W. Kirch [signature] 3-1-99 | [ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments |
| Signature of EDT Originator Date | Authorized Representative for Receiving Organization Date | Design Authority/ Cognizant Manager Date | |

BD-7400-172-2 (05/96) GEF097

# Organic End State Analysis of Tank 241-S-102

K. D. Fowler
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U.S. Department of Energy Contract DE-AC06-96RL13200

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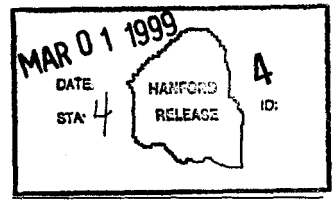



3/1/99
Release Approval Date
Release Stamp

**Approved for Public Release**

# ORGANIC END STATE ANALYSIS OF TANK 241-S-102

## 1.0 PURPOSE

This document provides a record of the organic end state analysis of tank 241-S-102.

## 2.0 OPEN ITEMS

There are no open items.

## 3.0 DESCRIPTION OF TANK 241-S-102

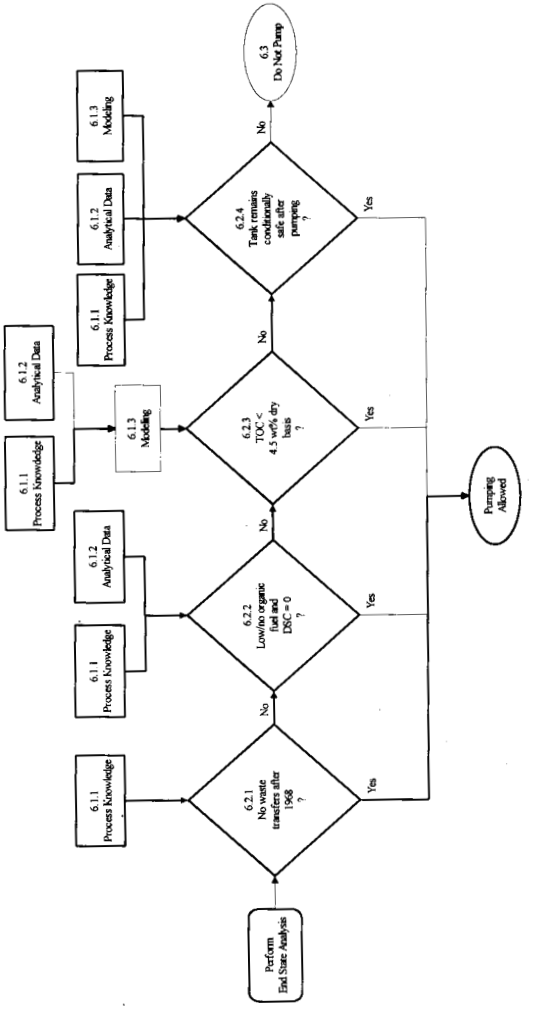
Tank 241-S-102 is one of twelve 22.9-meter (75-feet) diameter single-shell tanks in the 241-S Tank Farm in the 200 West Area of Hanford. This tank was built in 1951 and has a capacity of 2870 kiloliter (kL) (758 kilogallon [kgal]). Tank 241-S-102 is the second tank in a three tank cascade that includes tanks 241-S-101 and 241-S-103.

According to Hanlon (1999), tank 241-S-102 currently contains 2078 kL (549 kgal) of waste comprised of 397 kL (105 kgal) sludge, 1681 kL (444 kgal) saltcake, 0 kL (0 kgal) supernatant. Included in those volumes is 871 kL (230 kgal) drainable interstitial liquid. The pumpable volume is estimated at 848 kL (224 kgal). The waste is designated as double-shell slurry feed (DSSF). Tank 241-S-102 is on the Hydrogen Watch List. Tank 241-S-102 has not been declared as a leaker.

## 4.0 METHOD OF ANALYSIS

Analysis of tank 241-S-102 is per the methodology in HNF-SD-WM-PROC-021, Revision 2-A, Section 20.0, "End-State Organic Analysis Methodology (Single-Shell Tanks)," (Adams, 1999). Figure 1 shows the decision logic used to determine if a tank can be pumped. Information that provides the input to a decision block (criterion) is evaluated. If the preponderance of evidence (information) supports an answer of "Yes" to the decision block, pumping is allowed. If a decision block is answered "No," the logic proceeds to the next decision block and associated inputs.

Figure 1. Logic To Determine Whether A Tank Can Be Pumped




Notes:
DSC = Differential scanning calorimetry
TOC = Total organic carbon

## 5.0 RESULTS OF ANALYSIS

Proceeding from left to right through the decision logic shown on Figure 1, a determination can be made as to whether saltwell pumping of tank 241-S-102 for interim stabilization will be allowed. The results of each step are presented in this section. The conclusion of this analysis is that tank 241-S-102 can be pumped because the tank will remain in the conditionally safe category after pumping. That determination is documented in this section.

### 5.1 Criterion 6.2.1: No Waste Transfers After 1968

Criterion 6.2.1 requires that there were no waste transfers into the tank after 1968.

Waste Transfer History

- A description of the waste transfer history is taken from Hodgson, et al. (1996) and from Place and Pagedor (1998). Tank 241-S-102 was filled with waste from the REDOX facility from the third quarter of 1953 until the second quarter of 1955. From the third quarter of 1973 until the first quarter of 1976 the tank was used for feed to the 242-S Evaporator/Crystallizer and contained evaporator bottoms waste. Therefore, tank 241-S-102 received waste transfers after 1968. In the second and third quarters of 1976 the tank received bottoms and recycle streams from the 242-S Evaporator/Crystallizer. From the fourth quarter of 1976 until the first quarter of 1978 the tank served as a low-heat evaporator feed tank. In the second quarter of 1978 the tank was designated as a future solids receiver and contained non-complexed waste. Tank 241-S-102 was deactivated in 1980. The waste was classified as DSSF in the fourth quarter of 1979.

Criterion 6.2.1 is not satisfied because waste transfers into the tank occurred after 1968. The decision logic branch requires performance of criterion 6.2.2.

### 5.2 Criterion 6.2.2: Low/No Organic and No Exotherms

Criterion 6.2.2 requires that the process history show the tank is expected to have no/low organic content (defined as the bulk waste possessing less than 0.53 wt% TOC) and that the differential scanning calorimetry (DSC) results show that there are no exotherms.

- The process history of tank 241-S-102 indicates that the waste is expected to meet the low/no organic fuel content criteria. Per Place and Pagedor, the total inventory of TOC in tank 241-S-102 is estimated at 11,800 kg. This mass of TOC is distributed through 2,078,000 liters of waste with a specific gravity of about 1.6. This results in a bulk TOC concentration of about 0.35 wt%. Additionally, tank 241-S-102 samples indicate an overall mean total organic carbon (TOC) content of 0.35 wt% with a relative standard deviation mean of 15.8 %. The mean plus the standard deviation does not exceed the 0.53 wt% criterion.

- Analysis indicates the tank 241-S-102 waste has not exhibited DSC results in excess of the 480 joules per gram dry weight basis action limit.

Both conditions of criterion 6.2.2 are met, permitting pumping of liquid from the tank.

### 5.3 Criterion 6.2.3: TOC Less Tank 4.5 Weight Percent Dry Basis

Criterion 6.2.3 requires that an analysis of variance (ANOVA) analysis using analytical data be used to determine whether the TOC in a tank is less than the limit of 4.5 wt% on a dry basis at the 95 percentile with a 95 percent confidence.

- A propagation analysis for all single-shell tanks is included in Meacham, et al., (1998). Results show that propagation is not possible in tank 241-S-102 because sample data and ANOVA modeling show low TOC concentrations.

A tank is considered to pass the ANOVA screening if the upper 95% bound dry combustible waste fraction of the tank is below 5%. For tank 241-S-102 the upper 95% dry combustible waste fraction is 0.1%. Therefore, Criterion 6.2.3 is met, permitting pumping of liquid from the tank.

## 6.0 CONCLUSION

The organic end state analysis of tank 241-S-102 concludes that the tank can be pumped for interim stabilization. Saltwell pumping of the tank will not cause the waste in the tank to be categorized as unsafe.

## 7.0 REFERENCES

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Place, D. E., and M. Pagedor, 1998, *Tank Characterization Report for Single-Shell Tank 241-S-102*, WHC-SD-WM-ER-611, Rev. 0B, COGEMA Engineering Corporation, Richland, Washington.

## CHECKLIST FOR DOCUMENT REVIEW

Document Reviewed: HNF-4095 Revision: 0

Scope of Review: Technical

| Yes | No | NA | |
|---|---|---|---|
| ☒ | [ ] | [ ] | Problem completely defined. |
| ☒ | [ ] | [ ] | Appropriate analytical methods used. |
| ☒ | [ ] | [ ] | Necessary assumptions explicitly stated and supported. |
| [ ] | [ ] | ☒ | Computer codes and data files documented. |
| ☒ | [ ] | [ ] | Data used in calculations explicitly stated in document. |
| ☒ | [ ] | [ ] | Data checked for consistency with original source information as applicable. |
| [ ] | [ ] | ☒ | Mathematical derivations checked including dimensional consistency of results. |
| [ ] | [ ] | ☒ | Models appropriate and used within range of validity or use outside range of established validity justified. |
| [ ] | [ ] | ☒ | Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations. |
| [ ] | [ ] | ☒ | Software input correct and consistent with document reviewed. |
| [ ] | [ ] | ☒ | Software output consistent with input and with results reported in document reviewed. |
| ☒ | [ ] | [ ] | Limits/criteria/guidelines applied to analysis results are appropriate and referenced. Limits/criteria/guidelines checked against references. |
| ☒ | [ ] | [ ] | Safety margins consistent with good engineering practices. |
| ☒ | [ ] | [ ] | Conclusions consistent with analytical results and applicable limits. |
| ☒ | [ ] | [ ] | Results and conclusions address all points required in the problem statement. |
| [ ] | ☒ | * | Review calculations, comments, and/or notes are attached. |

☒ [ ] [ ] **Document approved.**

P.A. Reynolds P.A. Reynolds 2/25/99

Reviewer (Printed Name and Signature) Date

* Any calculations, comments, or notes generated as part of this review should be signed, dated and attached to this checklist. Such material should be labeled and recorded in such a manner as to be intelligible to a technically qualified third party.

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