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CRITERIA - WASTE TANK ISOLATION AND STABILIZATION

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PRELIMINARY REPORT

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NOTICE

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INTRODUCTION

The goal of the waste management program for Hanford high level wastes stored in single-shell underground tanks is to reduce the liquid volume by evaporation and crystallization, thus converting the wastes from a liquid form to a less mobile solid form. The solids resulting from the storage and crystallization processes are sludges and salt cakes which are covered with supernatant liquor and saturated with interstitial liquor.

The purpose of waste tank stabilization and isolation is to reduce the number of significant release sources and minimize the liquid volume which could be lost as a result of a loss of tank integrity. Implementing waste tank stabilization and isolation will minimize the residual liquid inventory in tanks and will modify the tanks such that no inadvertent liquid additions can be made.

A tank which has been stabilized using the following criteria will still contain a liquid heel. Some of the liquid heel will remain in the tank held by capillary forces; some will not. It is the intent of ARHCO to develop additional technologies and methods to immobilize all the liquid heels remaining in single-shell tanks.

PHILOSOPHY

ISOLATION

Isolation means segregating a tank (or series of tanks) from active tanks or active tank farm processes; this minimizes the potential for any unplanned liquid addition. The objective of isolation is to provide at least one positive physical barrier to any credible source of liquid addition precluding any other intrusions except necessary air ventilation.

STABILIZATION

Stabilization means removing or immobilizing as much tank liquor as is feasible with state of the art technology (reference 2). Stabilization is largely dependent upon the technology and equipment available. Current technology and equipment is limited to: salt well pumping, open-hole salt well pumping, the addition of an absorbent material, or in-situ drying in certain tanks.

CRITERIA FOR WASTE TANK ISOLATION AND STABILIZATION

ISOLATION

This criteria defines the basis for physical tank and tank piping modifications to prevent inadvertent liquid additions to the tank. At least one physical barrier to credible liquid intrusions is required.

Isolation Criteria

1. Risers

   The risers on isolated tanks shall be sealed in the manner prescribed below.

   a. Surveillance or Process Risers - Risers being used for surveillance or process purposes (reference 1) on the tanks shall be fitted with an engineered system approved by the Development Engineering Department.

   b. Risers Terminating Below Grade - No special treatment is required for risers terminating below grade provided that there is at least three feet of soil cover over the blind flanges. Risers below grade with less than three feet of soil cover will be treated in the same manner as those terminating above grade.

   c. Risers Terminating Above Grade or In Pits - Risers terminating above grade shall be closed to seal against a pressure of 12 inches of water. Risers terminating in pits need not be sealed for 12 inches of water, providing the pit cover is sealed against the intrusion of rain or snow water and lines entering the pit meet the isolation criteria for lines.

2. Lines

   Lines entering a tank, tank riser, or tank pit (e.g., fill lines) and pumpout lines shall be sealed at the appropriate diversion box or pit by a closure suitable to insure against unauthorized removal and shall be capable of retaining a pressure of 12 inches of water. Cascade lines between inactive tanks need not be individually sealed if the tanks are segregated as a group.

   If one tank must be isolated from the other tanks in a cascade prior to the segregation of the entire cascade, all lines entering and leaving the isolated tank shall be sealed.

3. Drain and Pit Covers

   Drain lines from pits to the isolated tank shall be diverted elsewhere or shall be sealed by plugs capable of sealing against a pressure of 12 inches of water. Hatchways or cover blocks over such pits shall be sealed to prevent the intrusion of rain or snow water.

4. Water, Steam, Air Lines

All water, steam and instrument air lines servicing isolated tanks shall be severed and sealed.

The tank atmosphere shall be confined according to the principles presented in reference 1.

STABILIZATION

This criteria defines the maximum liquid removal and immobilizing capability of present technology (references 4, 5, 6 and 7). The goal of the stabilization development program is to remove or immobilize all the liquid in single-shell Hanford tanks. This stabilization criteria will be revised as experience is gained in the stabilization of waste tanks and technology is developed which will allow additional liquor removal or immobilization.

This criteria is applicable to all single-shell tanks. Each tank requires an individual evaluation which may result in deviation from this criteria. Development Engineering Department must approve any deviation from this criteria.

Stabilization Criteria

It is not presently possible to remove all gravity drainable liquid from a waste tank. This criteria takes into consideration the fact that stabilization is limited by the physical configuration of the waste tank, the physical and chemical characteristics of the waste solids and liquids, and the limitations of available liquid removal equipment and current immobilization technology.

Within the limitations noted for tank stabilization and according to the criteria for salt well pumping, a waste tank will be classified as stabilized when:*

- The observed salt well inflow rate is less than the minimum available pump-out rate such that no net salt well production can be achieved.
- Any residual surface liquid has been removed or immobilized.
- An engineering assessment has been made to verify that the above items have been completed.

Salt Well Pumping

The following equipment items are required for salt well pumping in tanks with two feet or more of solids (reference 2):

Salt Wells:

- Normally one salt well tank is required. If liquid pockets are found, additional wells may be required.

- The salt well will be located within ten feet of the center of the tank and extended to within 2.5 inches of the bottom of the tank.

* Core sampling results are intended for inclusion when development is completed.

Liquid Level Wells:

- At least two liquid level observation wells are required per tank (excluding liquid level wells in or adjacent to salt well). These wells will be positioned at least ten feet distant from each other and any other wells and will be used to verify liquid drainage.

Pump:

- The pump suction will be located within two inches of the internal bottom of the salt well and will be sized for optimum liquid removal. Currently, optimum salt well pumping equipment is a low flow jet pump, providing a pumping rate of 0.1 to 5.0 gallons per minute.

A tank will normally be designated for salt well installation to remove surface and interstitial liquors if the solids depth in the tank is two feet or greater. The salt well pumping operation is complete when the salt well is pumped on three separate consecutive days with no net gallons of liquid transferred. Verification that the well screen is open and the pump is working is required by observing salt well liquid level during flushing and pumping.

Open-Hole Salt Well Pumping

Open-hole salt well pumping will be performed in tanks with less than two feet of solids. Open-hole salt well equipment consists of a pump with no screen casing. Liquid level wells are not required. The pump may be a jet pump or turbine type pump or other type pump with the intake located within ten feet of the tank center and 2.5 inches of the tank bottom. The pump intake must be at or below the solids layer and as near the tank bottom as possible. A guideline for ceasing the open-hole salt well pumping is when the well is pumped on three separate consecutive days with no net gallon of liquid transferred and it is verified the pump is working.

Diatomaceous Earth Additions and Air Drying

Visible free standing liquid may be unpumpable with salt well techniques, yet is mobile and may leak from the tank. Normally, unpumpable puddles of liquid will be no greater than 1,000 gallons.

Tanks containing a combination of high heating sludges and unpumpable puddles of liquid are candidates for the preferred method of in-situ drying of the liquid. Drying may be used in other situations noting, however, that many years may be required to obtain dryness. Diatomaceous earth additions will be considered to absorb unpumpable puddles in a leaking tank or a tank that has a high probability of leaking before the unpumpable liquid puddle may be dried. Diatomaceous earth additions must be sufficient to immobilize all free standing liquid but not in excess of the amount required for immobilization.(3) Diatomaceous earth additions must be approved by the Manager, Development Engineering Department.

Engineering Assessment

An Engineering Assessment is required to verify that as much tank liquid has been removed or immobilized as is feasible under existing technology. This assessment may consist of, but is not limited to, the following:

- Maximum feasible quantity of gravity drainable liquid will be considered removed when the net pumpout rate of liquid from the salt well approaches zero and liquid level well measurements confirm uniform drainage. An estimate of the total "drainable and non-drainable liquid remaining in the tank should be made.

- A review of in-tank photographs should be made to verify drainage completion and to verify the effectiveness of any diatomaceous earth additions or air drying.

- Evidence of pockets of liquid will be evaluated individually by the Engineering Department to determine what special action is required.

- A review of pumping data, production data and available sample data will allow estimates of the following properties of the tank being stabilized:

  . overall bulk permeability
  . permeability of any layered solids
  . theoretical steady-state in-flow rate
  . observed steady-state in-flow rate
  . pumping capacity at near-heel conditions

  The above estimates must be self-consistent indicators of liquor in-flow rate approaching the minimum pumping rate capability.

EXCEPTIONS TO CRITERIA

There may be specific instances where the general guidelines presented above require clarification or where a different approach is more practical. Exceptions to these criteria must be approved by the Development Engineering Department.

REFERENCES

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