Assessment of Operational Readiness of the Safety Class Double Contained Receiver Tank Ventilation System

Site:	Office of River Protection, Hanford
Facility:	Tank Farms
System:	Double Contained Receiver Tanks (DCRT) Ventilation System
System Classification:	Safety Class (Prevention of Flammabla Gas Accumulation) Safety Significant (HEPA Filters for 244-A, 244-S and 244-TX) General Service (HEPA Filters for 244-BX and 244-CR)
System Safety Function:	Confinement Ventilation and Prevention of Flammable Gas Accumulation caused by steady-state gas releases from waste in the tank.

OBJECTIVE:

VSS-1 **This vital safety system is operational and personnel and processes are in place that ensures its continued operational readiness.**

VSS-1.1 VSS safety functions are defined and understood by responsible line managers, and supporting information/documentation is available and adequate. System testing is adequate to ensure operability. (Review Approach items 1, 2, 3 and 7)

Discussion of Results –

The safety function of the DCRT ventilation systems (Final Safety Analysis Report (FSAR) Chapter 4) is to prevent the accumulation of flammable gases due to steady-state releases, thus decreasing the frequency of the flammable gas deflagration accident (Section, 3.4.2.2).

The safety function of the 244-TK-CR-003 ventilation system (FSAR Chapter 4) is to prevent the accumulation of flammable gases due to steady-state releases, thus decreasing the frequency of the flammable gas deflagration accident (Section, 3.4.2.2).

The safety function of the HEPA filters (244-A, 244-S, and 244-TX) is to provide filtration of headspace gases before their release to the environment, thus reducing the likelihood of unfiltered release accidents.

The ventilation systems are credited with preventing the accumulation of flammable gases due to steady-state releases during normal operations. The flammable gas deflagration accident is in Section 3.4.2.2 of the FSAR. The DCRT confinement ventilation system is credited with preventing the release of radiological and toxicological material to the environment.

Five of the six DCRT systems were reviewed. One DCRT (244-U DCRT) is a facility that hasn't been put in service. The 244-U DCRT was not reviewed for having to meet the safety functions/requirements.

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The DCRT facilities that were reviewed are identified as 244-A, 244-BX, 244-CR, 244-S and 244-TX.

DCRT's 244-A, 244-BX, 244-S and 244-TX each have a purge air system that supplies air to the dip tubes and provides a minimum total inlet airflow of 3 ft^3/h to the tank while waste is stored. The dip tube flow indicators shall have a minimum range of 0.2 ft^3/h to 1.5 ft^3/h. Only during waste transfers from Tanks 241-SX-104 and 241-SX-105, the DCRT 244-S level dip tubes shall supply minimum total inlet airflow of 5 ft^3/h.

The 244-CR ventilation system shall be operating when there is waste in the tank and operators will verify operability twice a day.

DCRT HEPA filter units shall be capable of removing at least 99.95% of particles as small as 0.3 μm with an approved challenge aerosol from the ventilation system air stream.

Verify the 244-A, 244-BX, 244-S, and 244-TX dip tubes are providing minimum total inlet airflow of 3 ft^3/h to the tank while waste is stored. Verify the minimum total inlet airflow to 244-S dip tubes, during waste transfers from Tanks 241-SX-104 and 241-SX-105, is 5 ft^3/h.

Verify the 244-CR ventilation system is operating when there is waste in the tank.

The DCRT HEPA filters are aerosol tested to verify that the filter is capable of removing at least 99.95% of the particles from the tank vent system. Therefore, the surveillance test meets the function(s), conditions, requirements, and performance criteria.

The testing conducted on the applicable HEPA filters for 244-A, 244-S, and 244-TX DCRTs is not in strict compliance with ASME N510, Section 10. Because of design configuration limitations, concentration of the challenge aerosol upstream of the HEPA filter is not verified per the standard during the 100% baseline portion of the test. The testing method measures penetration of an approved challenge aerosol through each filter, but full confidence in the results cannot be demonstrated because of the ASME N510 testability deficiency.

The design and construction of the DCRTs pre-dates the formulation of the design standard ASME N509, and therefore it is difficult to find a method of testing for upstream concentration of challenge aerosol that meets ASME N510 in-place filter testing criteria because of design configuration. It was also recognized that the DCRTs have a relatively short-term remaining life (<5 years) in terms of mission activity, and that any modifications should probably be supported by a cost-benefit analysis that appropriately weighs the risk against the cost. The open Unreviewed Safety Question evaluation is being resolved for the testing of the HEPA filters.

In consideration of both filter testing configuration limitations and other existing emission controls (daily filter differential pressure readings and CAM fan interlocks), optimization of test methods and procedures for the DCRT HEPA filters has occurred over the past five (5) years to the satisfaction of the Washington State Department of Health (WDOH), the regulatory authority for radioactive air emission. WDOH Letter # AIR 99-913 (September 23, 1999) accepted the As Low As Reasonably Achievable Control Technology (ALARACT) demonstration of the filter testing optimizations to close its related Notice of Correction issuance.

The surveillance test frequency for the 244-A, 244-BX, 244-CR, 244-S, and 244-TX, Rotameters are verified operable at least twice per day and functionally tested every 365 days. An approved aerosol test is performed after installation and every 12 months thereafter.

Operability of Rotameters are verified a minimum of twice each day per FLAMMABLE GAS LCO 3.2.4. AC 5.18 requires a DCRT filter efficiency test. AC 5.18 (HEPA Filter Controls) requires periodic verification of HEPA filter radiation levels. Functional testing of the HEPA filter is performed annually.

The conversion of existing drawings to computerized drawings is needed for these facilities. The new drawings would facilitate the incorporation of outstanding Engineering Change Notices. The existing hand generated drawings are not readily updated when facility changes are completed. These facilities design media, when updated, will provide safer working conditions for the staff.

Drawings are maintained in the CH2M Hill Hanford Group Inc. Document Control Program. The contractor retains the drawing files and the higher priority drawings are validated by field walk-down of the systems.

The safety systems will need to have the role of each unique piece of equipment defined. These requirements need to be defined in an update to the RPP Safety Equipment List.

Necessary and adequate procedures and policies are in place and have been effectively implemented supporting the conclusion that management understands their responsibilities.

In addition, boundary drawings are needed to help clarify the safety systems within each facility and the interfaces to supporting structures, systems and components.

VSS-1.2 The backlog for surveillances, tests, inspections, maintenance, repair, upgrades, or other work on the system is managed and kept to an appropriate minimum. (Review Approach item 6)

Discussion of Results –

There are presently 2 packages against these systems that are in the backlog. They are to replace belts on the exhaust fan in 244-CR and replacement of the Rotameters in the 244-A DCRT. The 244-A DCRT Rotameters are functioning properly, but need to be changed out, because they are dirty and cannot be read easily. The work instructions for the replacement of the Rotameters, identifies the replacement of the units one at a time to prevent from entering the LCO 3.2.4 action statement. At this time 244-U is an inactive facility. None of these work packages affect the overall reliability or safety class function of these systems.

VSS-1.3 Configuration Management and Maintenance programs effectively ensure operational availability of the system. (Review Approach items 5, 8 and 9)

Discussion of Results –

The maintenance program is well established and procedures are in place. The operator routines that review the systems performances are performed daily. Configuration management of fieldwork and/or modifications is performed in accordance with procedures. The Shift Operations Manager is responsible for maintaining the system in an operational status.

VSS-1.4 The system is operable and available to fulfill its safety function when required. (Review Approach items 4 and 10)

Discussion of Results –

During the review period the systems have continually met the test requirements. There were three circumstances that the HEPA filter did fail the challenge aerosol test. The overall evaluations of these failures are contained in the conclusion.

The purge air system failed to respond to the facility operating conditions 15 times. A total down time of 32 hours corresponds to the 15 occurrences.

The cumulative purge air systems availability was at 99.49% for the five operable DCRTs.

The DCRT systems and equipment that directly support these facilities are the compressed air, electrical power and alarm systems. A review of the support equipment shows that all equipment is in place and is operational.

CONCLUSIONS:

Flammable Gas - This review has established that the DCRT systems are operational and personnel and processes are in place that ensures its continued operational readiness. Dip tubes are routinely flushed and Rotameters flow rates are verified each shift. Portable air compressor connections are provided at each facility that permits the use of an alternate air source while the primary compressor is being repaired or inspected. Because of the redundant use of Rotameters and alternate air supplies, the overall availability of the safety function is greater than 99.7% for 244-S and 99.9% for the remaining DCRTs. The longest single unplanned outage of any DCRT purge air system was 20 hrs 20 min. In accordance with the AB calculations this time is much less than the time required for the tank headspace to attain 100% LFL.

Confinement - This review has established that the DCRT ventilation systems are operational and personnel and processes are in place to ensure their continued operational readiness. The overall availability of the safety function is greater than 99.9%, except as noted below.

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It was also recognized that that the DCRTs have a relatively short-term remaining life (<5 years) in terms of mission activity, and that any modifications should probably be supported by a cost-benefit analysis that appropriately weighs the risk against the cost.

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DOE employee who reviewed this assessment ___DOE Review Team_____ Date __2/28/01_
(*See below)

Hours required for completing the assessment.

DOE: __40___ Hrs.

Contractor: __240__ Hrs.

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