MESSAGE CONFIRMATION

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Date: 12/1/92 Number of Pages: 6

To: DAN DUNCAN Phone: (206) 553-6693

Location: EPA - SEATTLE Fax Number: (206) 553-0957

From: SJ SKURLA Phone: (509) 372-1102

Message: ATTACHED ARE COPIES OF THE LAST 3 CHANGES. PLEASE REVIEW AND LET ME KNOW ASAP IF THERE ARE ANY PROBLEMS

STEVE

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breakthrough is detected, the primary charcoal unit will be removed and the secondary unit would become the primary unit. A fresh unit then would be installed as the secondary unit. Breakthrough of the first stage charcoal adsorber will be considered to be at 10 parts per million as shown on the organic vapor analyzer. The analyzer will be set to alarm at that point. Operations will be stopped within 24 hours of the alarm, and the adsorber changed out. Immediate shutdown is not necessary because of the redundant emission control provided by the second stage charcoal adsorber. In the event that the organic vapor analyzer indicates breakthrough when the pilot plant processes are not operating, but a tank inventory is present (e.g., weekend), the adsorber will be changed out within 72 hours. Without the processes operating, the loading will be minimal and protection is provided by the second stage adsorber. The 72 hour limit is based on limited craft availability during the weekend. Manufacturer's information on the organic vapor analyzer is presented in Appendix 4C.

4.1.3.3 Emission Monitoring Equipment. Stack effluent radionuclide content will be monitored with a particulate record sampler. These sampling systems remove a sample from the stack and pass the sample through a 1.9 inch (47 millimeter) filter. The sample flowrates are controlled by a rotameter, which is calibrated routinely. The record sampler filter will be collected monthly and analyzed for total alpha and beta/gamma activity.

The organic vapor analyzer is used to determine breakthrough of the first stage charcoal adsorber as described in Section 4.1.3.2. Because a redundant, second stage charcoal adsorber is located downstream of the analyzer, this analyzer does not directly monitor organic emissions to the environment. The organic vapor analyzer is a photoionization detector (PID) operating at a continuous sample flow rate of 0.1 cubic feet (3 liters) per minute. The operating range will be set at 0 to 100 parts per million with a resolution of 0.1 part per million. Because the analyzer is being used to determine the changeout of the first stage charcoal, and not to quantify emissions, a two point calibration will be accomplished utilizing zero and span calibration gases. The span gas will be 5 to 30 parts per million (5 to 30 percent of scale) of a volatile organic most representative of the vapors expected in the ventilation system and commercially available.

4.1.4 Waste Water Pilot Plant Capacity

The throughput of any operation at the waste water pilot plant will be nominally 5 gallons (19 liters) per minute which is the equivalent to 300 gallons (1,100 liters) per hour. The ultraviolet oxidation unit will operate at flow rates as high as 25 gallons (95 liters) per minute in the recycle mode, but have a 5 gallon (19 liters) per minute throughput. The 1706-KE process diagram is shown in Figure 4-2 and Appendix 4A. The waste water pilot plant can be operated with a maximum of 5,000 gallons (19,000 liters) per batch. This limit is based on the size of the tank trailer [5,000 gallons (19,000 liters)]. The test program will be structured to accommodate up to one 5,000 gallon (19,000 liter) batch per week [20,000 gallons (76,000 liters) per month]. A process rate of one tank trailer every two weeks is anticipated during normal operations. Storage capacity at the waste water pilot plant will include two 5,000 gallons (19,000 liter) tank trailers and two 3,000 gallon (11,000 liter) intermediate storage tanks for a total of 16,000 gallons (61,000 liters) of potentially available storage. Filtration equipment at LERF will be sized at 5 gallons (19 liters) per minute [300 gallons (1,100 liters) per hour)] or less for each of the three units, for a total of 15 gallons (57 liters) per minute. There will be no storage capacity associated with the LERF equipment.

The amounts of waste tested at the waste water pilot plant will exceed limits contained in the guidance document for research, development, and demonstration permits (EPA 1986a). The guidance document specifies limits of 400 kilograms (100 gallons) per hour through-put, 15,000 kilograms (4,000 gallons) per month for treatment, and 15,000 kilograms (4,000 gallons) for storage. The conversion of kilograms to gallons was made using factors of 2.2 pounds per kilogram and 8.34 pounds per gallon of waste.

The guidance limits for throughput (EPA 1986a) must be exceeded because 5 gallons (19 liters) per minute is the smallest process units that are commercially available. The flowsheet for the waste water pilot plant was developed around this 5 gallon (19 liters) per minute limit. The totals given for the amount of waste tested per month and the storage capacities are maximum values; actual operations are likely to be less. Normal operations at the waste water pilot plant will require storage of 5,000 gallons (19,000 liters) of waste.

4.1.5 Technologies to be Tested

The types of technologies that will be tested in the waste water pilot plant include the following:

- pH adjustment
- Organic removal (e.g., ultraviolet light mediated oxidation and granular activated carbon)
- Inorganic removal (e.g., reverse osmosis and ion exchange)
- Suspended solids removal (e.g., filtration).

Each of the technology types are summarized in the following sections. A general description of the technology, a description of the equipment to be used in testing, identification of the critical parameters of each technology, and a description of the safety features of each type of equipment are presented.

A summary of the critical parameters of each technology that will be part of the waste water pilot plant is presented in Table 4-4. Also presented is a more detailed description of the critical parameters and how the parameters affect the operation and safety of the equipment. The instrumentation typically used to monitor these critical parameters is specified in Table 4-4.

Volatile Organic Concentrations in the Inlet to the 1706-KE Building Ventilation System Charcoal Filter Using "Spike" Concentrations

Purpose

The purpose of this analysis is to calculate the expected inlet concentrations to the 1706-KE Building charcoal system so that the expected breakthrough concentration setpoint for the volatile organic chemicals (VOC) analyzer can be determined.

Assumptions

1) The charcoal system is on the ventilation branch for the tank vents. The tanks vented include: tanker trucks (2), intermediate storage tanks (2), surge tanks (2) and filtrate tank.

2) Liquid treatment feed rate: 5 gallons per minute (nominal)

3) Vent flow rate: 50 cubic feet per minute (cfm) (rating for TIGG Model N50 at 7 inches H_2O)

4) The average molecular weight of the five most prominent compounds in Table 4-3 is 67.5. These five compounds (1-butanol, acetone, pyridine, carbon disulfide, and formic acid) make up 92 percent of the volatile organics present in the spiked feed.

5) Feed concentration: 2.989 pounds (lb) VOC per 1,000 gallons (gal). This is the maximum concentration as stated in Table 4-3.

Calculations

Assuming 100 percent volatilization of the max concentrations and temperature of 70 °F [529 °Rankine (°R)]:

$$\left(5\ \frac{\text{gal}}{\text{minute}}\right)\left(\frac{2.989\ \text{lb VOC}}{1{,}000\ \text{gal}}\right)\left(\frac{1\ \text{lb-mole}}{67.5\ \text{lb VOC}}\right)\left(359\ \frac{\text{ft}^3}{\text{lb-mole}}\right)\left(\frac{529\ °\text{R}}{492\ °\text{R}}\right) =$$

$$\left(0.08531\ \frac{\text{ft}^3\ \text{VOC}}{\text{min}}\right)$$

$$\frac{(0.08531\ \text{cfm VOC})\ (1{,}000{,}000)}{50\ \text{cfm total}} = 1{,}706\ \text{parts per million VOC}$$

Therefore, if only 10 percent of the volatile organic compounds are volatilized, then the VOC concentration to the charcoal would be 171 parts per million. Likewise, if only 1 percent volatilization occurs, then the inlet concentration would be 17 parts per million.

Conclusions

Because the pilot plant is designed to minimize the volatilization of feed compounds, the value of 1 percent of the maximum concentrations is realistic. The recommended VOC analyzer control point should be 10 parts per million. This will be low enough to detect breakthrough, but should be high enough to prevent false alarms.

Analysis prepared by:

R. S. Pavlina
Chemical Engineering Laboratory
Westinghouse Hanford Company
November 12, 1992

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Volatile Organic Concentration in Tank Trailer Ventilation Air at the Liquid Effluent Retention Facility Load/Unload Station

Purpose

The purpose of this analysis is to estimate the volatile organic compound (VOC) concentration in the air vented during the filling of the tank trailer at the LERF load/unload station.

Assumptions

1) The VOC concentrations used in this analysis are the 90 percent confidence interval values reported in Table 4-2.

2) The average molecular weight of the VOC is 73. This is a weighted average value based on the molecular weights of acetone (58) and 1-butanol (74). These two compounds contribute 97 weight percent of the VOC in the waste water. (Table 4-2, "90 percent confidence values).

3) 100 weight percent of the VOC are volatilized into the trailer ventilation air stream.

4) One gallon of tank trailer air is vented for every gallon of wastewater pumped into the tank trailer.

5) Maximum VOC loading in the wastewater is 12.4 parts per million (ppm), or 0.517 pounds (lbs) VOC per 5,000 gallons (gal).

6) The temperature is 70 degrees Fahrenheit (°F) [529 degrees Rankine (°R)].

Calculation

$$\text{VOC (ppm)} = (0.517 \text{ lb VOC}/5{,}000 \text{ gal}) \times (7.48 \text{ gal/ft}^3) \times (529\ ^\circ\text{R}/491\ ^\circ\text{R}) \times (1 \text{ lb-mole VOC}/73 \text{ lb VOC}) \times (359 \text{ std ft}^3/\text{lb-mole}) \times 1{,}000{,}000$$

$$= 4{,}100 \text{ ppm}$$

However, if only 10 weight percent of the VOC is volatilized, then the VOC concentration to the charcoal adsorber would be 410 ppm. Likewise, if only 1 weight percent volatilization occurs, then the inlet concentration would be 41 ppm.

Conclusions

Because the trailer loading is conducted through a submerged outlet, volatilization will be minimal and is expected to be approximately 1 weight

Volatile Organic Concentration in Tank Trailer Ventilation Air at the Liquid Effluent Retention Facility Load/Unload Station (cont)

percent. Therefore, the "maximum" feed case, the VOC concentration in the tank trailer exhaust air (feed to the carbon adsorber) will be approximately 40 ppm.

Analysis prepared by:

D. E. Scully
Effluent Process Engineering
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