COLUMN TEST USING ORGANOCLAY® MEDIA

1. Scope

1.1 This test method covers the determination of using CETCO's organoclay technology to remove contaminants from liquids. These contaminants include but not limited to oil/grease, NAPL, partial soluble and insoluble organics, and certain heavy metals.

1.2 The conditions by which the column test is run may need to differ from those encountered in the field.

1.3 The influent and effluent from this column test can be characterized in values of TOG, TPH, dissolved PAH, Hg, etc. Each specific organic species can be measured using GC or GC/MS instrument. The concentration of heavy metals ions can be measured through ICP or AA methods. Contaminants of concern and analytical methods used are determined on a project-specific basis. The adsorption capacity of the organoclay could also be calculated once the breakthrough curve is collected.

2. Apparatus

Clear PVC type column with, inner diameter of 4.8 cm and in variable length (typical 6") for inorganic contaminants of concern or CHROMAFLEX® type column (www.kontes.com) for organic contaminants of concern.
Rubber stoppers, with hole
Glass wool
FEP Teflon® tubing
Ring stand
Clamps
Tubing pump
Beakers in appropriate sizes
Magnetic stirrer, with stirring bar
CETCO's filter cloth, could be replaced by filter paper
Graduated cylinder, 100 mL
Balance, with 0.1g sensitivity
Timer
pH meter

3. Materials/Reagents

Organoclay® media
Water, deionized

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4. Sample and Its Preparation

4.1 Sample

Liquid to be tested, minimum 1-liter is required to conduct multiple analytical tests. A large quantity of liquid sample is necessary in order to reach breakthrough.

If only a portion of entire sample is going to be pumped, ensure that it is representative.

4.2 Use of Filter Cloth

The wastewater can be pre-filtered using a CETCO's filter cloth through gravity if high concentration of solids is observed. Then the filtered wastewater will be noted as the influent.

5. Procedure Organoclay® Media

5.1 Take cylindrical column and stopper one end, add 1-2 cm height of glass wool to the inside of this end to prevent media from leaking through the hole.
5.2 Put the column with stopper and glass wool on the balance and tare it.
5.3 Pour organoclay® media into the column and tap the side of the column to ensure the media is settled and packed. Leave ~ 4 cm height of empty volume on the top of this column.
5.4 Weigh and record the media mass.
5.5 Add another 1-2 cm height of glass wool to the top end of the column and close with another rubber stopper.
5.6 Plug in the Teflon tubing to each end of the column and clamp the column onto the ring stand.
5.7 Put Teflon® tubing from the bottom end of the column through the tubing pump and into beaker with deionized or influent water. Place the tubing on the top side into the beaker for effluent collection. Further attach the tubing to the beakers to prevent tubing movement if necessary.
5.8 Pump at least one empty bed volume (1 BV per 6.1) of deionized water through the column to pre-hydrate the media before pumping the actual influent. The flow rate can be measured using a graduated cylinder and a timer. Pump at a slow rate (≤10 BV/hr). Continued release of bubble-free water can indicate the success of this hydration process.
5.9 A typical flow rate for this column test is 10 BV/hr (equal to 6-minute retention time). Use the pump dial to adjust the flow rate.
5.10 Once the media is hydrated and the flow rate is set, place the Teflon® tubing into the influent water. The influent water should be agitated through stirring using a magnetic stirring bar.
5.11 Turn pump on and don't collect the effluent sample until the trapped deionized water has been fully released through the column.
5.12 Collect enough effluent samples as needed to conduct further analytical tests and make required calculations.
5.13 Breakthrough starts when the effluent concentration exceeds a designated concentration (e.g., regulatory concentration). A single value from the designed analytical test could be used to determine the breakthrough point.

6. Calculations

6.1 Bed Volume

1 BV = one empty bed volume, mL
M = weight of Organoclay® media, g
D = bulk density of Organoclay® media, g/mL
1 BV = M / D

6.2 Adsorption Capacity (at breakthrough)

Mc = adsorbed contaminant mass determined from the concentration-volume breakthrough curve by converting the area between the influent line and the effluent curve at breakthrough into mass.
C = organoclay adsorption capacity of a specific contaminant for the test liquid

C = Mc/M (g/g)

7. Report

7.1 Types of media involved, Organoclay® media.
7.2 Flow rate and total volume of liquid pumped.
7.3 Values from analytical test results for both influent and effluent.
7.4 Concentration versus volume curve.
7.5 Adsorption capacity at breakthrough, if achieved.

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