SAUDI STANDARDS, METROLOGY AND QUALITY ORGANIZATION

Project No. 33126:2023

Test Methods of Alkali Drain Cleaner

ICS 71.100.40

Test Methods of Alkali Drain Cleaner

1. Scope and Field of Application

This standard is concerned with the methods of testing dry, granular, free flowing alkali drain cleaner used for the removal of impediments (materials) other than cellulosic material that restrict the flow of water in drains.

2. Complementary References

2.1 SASO 1057 "Alkali Drain Cleaner".

3. Visual Inspection

Containers and the marking shall be visually inspected for conformity with the Gulf standard mentioned in 2.1.Also the product samples shall be inspected for freedom from objectionable odours and solid lumps.

4. Determination of Particle and Aluminium Chips Size

4.1 APPARATUS

4.1. 1 Tyler Sieve No. 3.5, of hole size 4000 micrometer, and another one of hole size 160 micrometer supplied with a receiver and a cover for determination of particle size as a whole.

4.1. 2 Tyler Sieve of hole size 2500 micrometer, and another one of hole size 800 micrometer for Determination of aluminum chips size supplied with a receiver and a cover.

4.2 Procedure

4.2.1.1 **Determination of Particle Size of Cleaner as a Hole**

A quantity of the cleaner is placed on top of the Tyler Sieve and Brittle lumps (if present) are broken. The sieve is then agitated manually or on a mechanical shaker for (5) minutes.

4.2.1.2 **Result**

The cleaner shall completely pass through the Tyler Sieve of hole size 4000 micrometer and 95 ٪ of it shall not pass through Sieve of hole size 160 micrometer.

4.2.2.1 **Determination of Aluminium Chips Size**

A quantity of the aluminum chips (specified in 6.2.5) is placed on top of the Tyler Sieve. Brittle lumps (if present) are broken. The sieve is then agitated manually or on a mechanical shaker for (5) minutes.

4.2.2.2 **Result**

The aluminum chips shall completely pass through the Tyler Sieve of hole size 2500 micrometer and shall not pass through Sieve of hole size 800 micrometer**.**

5. Determination of Temperature Rise and Measuring of Foaming Head When The Cleaner Is Dissolved In Water

5.1 Apparatus

5.1.1 Heat-resistant test tube, 30 X 3.8 cm.

5.1.2 Thermometer fixed on a cork stopper.

5.2 Procedure

Add quickly in the test tube 30g of the cleaner to 100 ml of distilled water at 15°C to 20°C. Insert the thermometer in the tube and record the highest temperature of the solution attained during 10 to 15 minutes .And measure the foaming head in cm when the tube is in a vertical Position.

5.3 Result

5.3.1 Determine the rise in temperature from the following equation:

Rise in temperature = Highest solution temperature (°C) – Initial temperature of the water (°C).

5.3.2 Check that the foaming head does not rise to more than 5cm above the surface of the solution.

5.3.3 Check the absence of the cleaner components in an insoluble form. The presence of a black flocculent precipitate is allowable.

5.3.4 Check that the reaction leads to severe churning of the aluminum chips on dissolution.

6. Determination of Aluminium Chips Content

6.1 Apparatus

Ordinary laboratory apparatus in addition to:

6.1.1 Mechanical or magnetic stirrer.

6.1.2 Oven adjusted at 105℃.

6.1.3 Sensitive balance.

6.2 Procedure

6.2.1 Weigh (30.0 ± 0.1g) of the cleaner sample and place it in a small dry glass beaker using a plastic spoon.

6.2.2 6.2.2 Place 500ml of cold distilled water (4°C to 7°C) in a 1000 ml Pyrex beaker, rapid agitation of the water with the mechanical or magnetic stirrer is made and add the weighed sample. Rinse a small glass beaker 4 to 5 times with 10 to 15 ml of cold distilled water and pour washings into the Pyrex beaker. Stir for 3 to 4 minutes or until all the components, except the aluminium chips, have been dissolved.

Remove the stirrer, and rinse it with cold distilled water and pour the washing into the beaker. The dissolution should be done quickly to prevent the aluminum from reacting.

6.2.3 Transfer the solution into a one liter volumetric flask, leaving the aluminium chips in the beaker , and rinse the chips three times with 10 to 15 ml of distilled water and quantitatively transfer the washing each time into the volumetric flask.

6.2.4 Adjust solution volume to one liter with distilled water, and mix several times by inversion of the flask and keep the solution to be used in the tests of items 7 and 8.

6.2.5 Using a plastic spoon, carefully transfer all the remaining aluminum chips into a small empty previously weighed glass beaker (m_1). Place the beaker in an oven adjusted at 105°C for 4h until the contents are completely dry. After cooling in a desiccator, weigh the beaker with the contents (m_1).

6.3 **Calculations**

Aluminum content shall be calculated from the following equation:

$$\text{Aluminum content (\% by mass)} = \frac{m_2 - m_1}{m_3} \times 100$$

Where:

m_1 = Mass of the glass beaker (g).

m_2 = Mass of the glass beaker + aluminum chips (g).

m_3 = Mass of the sample (g).

7. Determination of Sodium Hydroxide Content

7.1 **Reagents**

7.1.1 Sulphuric acid 0.1 mol/l.

7.1.2 Phenolphthalein indicator.

7.2 **Apparatus**

7.2.1 250 ml Erlenmeyer flask.

7.2.2 25 ml pipette.

7.2.3 50 ml burette.

7.3 **Procedure**

Transfer with pipette 25 ml of the solution in the flask (6.2.4) into the 250 ml Erlenmeyer flask containing 40 to 50 ml of distilled water. Add 5 drops of phenolphthalein indicator and titrate with sulphuric acid solution (7.1.1.) until the disappearance of the pink colour.

7.4 **Calculations**

Sodium hydroxide content shall be calculated as follows:

$$\text{Sodium hydroxide content (\% by mass)} = \frac{V \times C \times 320}{m}$$

Where:

V = Volume of sulphuric acid used in the titration (ml).

C = Concentration of Sulphuric acid in (mol/1).

m = Mass of the test sample (g)

8. Determination of Sodium Nitrate Content

8.1 **Reagents**

8.1.1 Ferrous sulphate solution ($FeSO_4$ 7 H_2O) 1 mol/l.

8.1.2 Concentrated sulphuric acid.

8.1.3 Potassium permanganate solution 0.02 mol/l.

8.2 **Apparatus**

8.2.1 250 ml heat-resistant glass beaker.

8.2.2 8.2.2 Glass beads.

8.2.3 One-liter glass beaker.

8.2.4 Burette (50 ml).

8.2.5 Pipette (25 ml).

8.3 **Procedure**

8.3.1 Transfer carefully 25 ml of the dried solution (6.2.4) which containing sodium nitrate into a 250 ml-heat resistant beaker together with 3 or 4 glass beads to reduce the strong agitation results from boiling. Add 25 ml of the ferrous sulphate solution then add 20 ml of the concentrated sulphuric acid with the attention to the importance wearing safety glasses or a face shield.

8.3.2 Boil the solution for 5 min until it changes to brown - deep orange. While the solution is boiling, place 500ml of distilled water into a one-liter beaker, while stirring the water carefully add the hot boiling solution. Rinse the reaction beaker 3 or 4 times with small amounts of distilled water, collecting the washings in the one-liter beaker.

8.3.3 While stirring slowly, titrate the solution with the standardized potassium permanganate solution to a pink pale colour appears and record the used volume of potassium permanganate (A).

8.3.4 Also titrate a blank specimen (the previous steps but without addition of the solution mentioned in (6.2.4)), and Titrate with the potassium permanganate solution to a pink pale colour and record the used volume of potassium permanganate (B).

8.4 **Calculations**

The sodium nitrate content (% by mass) is calculated as follows:

$$\text{The sodium nitrate content (\% by mass)} = \frac{(A-B)\times C\times 566.6}{M}$$

Where:

A = volume of potassium permanganate to titrate specimen (ml)

B = volume of potassium permanganate to titrate blank (ml)

C = concentration of potassium permanganate (mol/l)

M = mass of the original specimen (g)

9. Determination of Sodium Chloride or Sodium Sulphate

The content of sodium chloride or sodium sulphate shall be determined by subtracting the contents of each of aluminum, sodium hydroxide, and sodium nitrate (items 6, 7 and 8) from 100 and calculating as % by mass.

10. Determination of the cleaner effect on construction materials (copper, iron, lead and plastic) using immersion test

10.1 **Apparatus**

10.1.1 100 ml beaker (4)

10.1.2 Watch glass (4) to cover beakers

10.2 **Procedure**

10.2.1 Preparation of Specimen

10.2.1.1 Prepare a piece of 2 cm length and 2 cm in width and thickness of 1 to 2 cm from each of tested materials (iron, copper, lead and plastic) being used for drainage systems.

10.2.1.2 Remove the substantial layer of metal (not required for plastic) by grinding with coarse abrasive paper No.50 or cloth.

10.2.1.3 Specimens should be degreased by rinsing with acetone or methanol (plastic washed using water and soap) and leave it dried in air.

***Note**: using towels may give errors.*

10.2.1.4 Specimen should be stored in desiccator if they are not used immediately.

10.2.2 Weight the prepared pieces and record the initial weight for each piece.

10.2.3 Prepare 4 beakers each one should have 50 ml distilled water and place the prepared pieces in the in the beakers (one pieces in one beaker).

10.2.4 Add 15 gram of the cleaner to every beaker and stir till complete dissolving and cover beakers with the watch glasses and leave the covered beakers for 24 hours.

10.2.5 Drain the cleaner solution and wash the pieces with distilled water and dry them, then record the final weight for each.

10.2.6 calculate the loss in weight in percentage (should not be more than 7٪ of the initial weight) as follows:

$$\text{Loss in weight in percentage} = \frac{(\text{Initial weight} - \text{Final weight})}{\text{Initial weight}} \times 100$$

10.2.7 Check if any deformation occurred to the pieces under test and record that no deformation is occurred.

11. Determination of oil content

Determine a mass of 300 g specimen in a 1L Erlenmeyer flask. Add 300 ml of petroleum ether or hexane and vigorously shake for 2 to 3 min (CAUTION: SOLVENT ARE FLAMMABLE – CONDUCT WORK IN A FUME HOOD) Cover flask with glass plate and allow contents to remain undisturbed for 5 to 8 min pipette 50 ml of the solvent layer into a tarred beaker. Evaporate this solvent on a steam bath a dry final traces of moisture in an oven. Cool beaker in a desiccator, weight it and determine the oil content (in percent) as follows:

$$\text{Percentage of oil content} = \frac{\text{Mass of oil (g)} \times 6 \times 100}{\text{Mass of Specimen (g)}}$$