

APPENDIX 1

Equipments, Apparatus and Procedure Used for Jar Test

A) Equipments and Apparatus

- a) Jar Test equipment - Model : Flocculator SW1

Brand : Stuart Scientific

- b) pH meter - Model : Sension 1

Brand : HACH

- c) Spectrophotometer - Model : DR/2010

Brand : HACH

- d) COD tester – Model : COD Reactor

Brand : HACH

- e) Drying Oven – Model : Size 1

Brand : Gallenkamp

- f) OIL & Grease tester - Model : Oil Content Analyser

Brand : HORIBA

- g) Weighing Balance - Model : AB304-S

Brand : Mettler Toledo

- h) 1000 ml Beakers

- i) Droppers

- j) Micro pipettes

- k) Graduated Pipettes

- l) Filter Funnels

- m) Conical Flasks

B) Reagents

- a) 5 % Hydrochloric Acid (HCl) – commercial grade
- b) 10 % Polyaluminium Chloride (PAC) – commercial grade
- c) 0.1 % Anionic Polyelectrolyte
- d) 4 % Hydrated Lime – commercial grade
- e) 1 % Potassium Hydroxide (KOH) – laboratory reagent
- f) 4 % Soda Ash (Na_2CO_3) – commercial grade
- g) 1 % Caustic Soda (NaOH) – commercial grade

C) Procedure

- 2) Four 1000 ml clean beakers were taken and labeled as Lime, KOH, Na_2CO_3 , NaOH.
- 3) The sample container was shaken to homogenize its contents.
- 4) 800 ml of sample was measured using measuring cylinder and poured into each of the beakers.
- 5) The four beakers with sample were put in the jar test equipment and stirred at 200 rpm.
- 6) pH for samples in all four beakers was adjusted to 3.0 with 5 % Hydrochloric acid and with the aid of a calibrated pH meter.
- 7) The pH was then raised to 7.5 using hydrated lime, potassium hydroxide, soda ash and sodium hydroxide in the respective beakers. The calibrated pH meter was also used for this step.
- 8) Polyaluminium chloride(PAC) equivalent to 10.7 ppm was added into each of the beakers.

- 9) After 15 minutes the floc size was noted.
- 10) Anionic polyelectrolyte equivalent to 2.5 ppm was added into each of the beakers and stirred for 5 minutes.
- 11) Stirrer speed was reduced to 40 rpm and stirred for 30 minutes. At the end of 30 minutes the stirrer was stopped.
- 12) The floc size was noted and the time taken for the visible flocs to settle was also noted.
- 13) The supernatant solution of each of the beakers was taken and tested for
 - a) Final pH after flocculation and settling.
 - b) Chemical Oxygen Demand
 - c) Suspended Solids
 - d) Chromium Hexavalent
 - e) Copper
 - f) Manganese
 - g) Zinc
 - h) Boron
 - i) Iron
 - j) Oil & Grease
 - k) Turbidity
- 14) The settled sludge was filtered using a pre-weighed filter paper and dried in an oven at 105 degrees Celcius. After drying it was re-weighed and the sludge weight was noted.
- 15) Steps 1 to 13 was repeated except for step 6 where the pH was raised to 8.0.
- 16) Steps 1 to 13 was repeated except step 6 where the pH was raised to 8.5.
- 17) Steps 1 to 13 was repeated except step 6 where the pH was raised to 9.0.

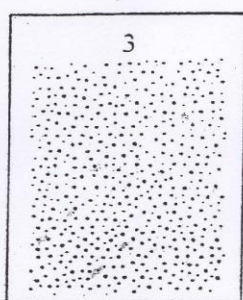
18) Steps 1 to 13 was repeated except step 6 where the pH was raised to 9.5.

19) Steps 1 to 13 was repeated except step 6 where the pH was raised to 10.0

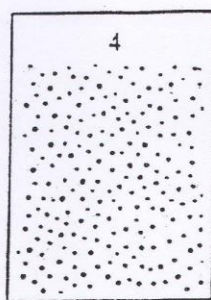
APPENDIX 2

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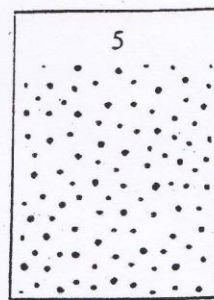
Floc Size:



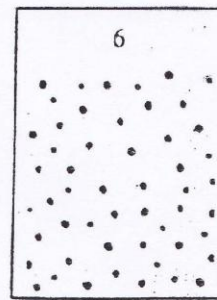
0.3mm - 0.5mm



0.5mm - 0.75mm



0.75mm - 1.0mm

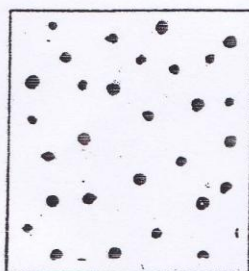


1.0mm - 1.5mm

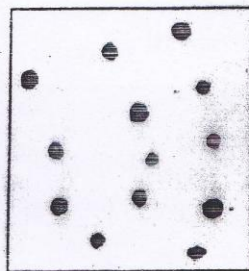
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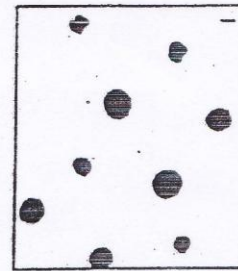
9



1.5mm - 2.25mm



2.25mm - 3.0mm



3.0mm - 4.5mm

These marks will permit easy comparison of the different waters.

Source : Contractor involved in plant commissioning