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INFLUENCE OF WATER CHARACTERISTICS ON A SLUDGE BLANKET

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Sludge Blanket clarifiers have many advantages over horizontal flow clarifiers. Suspended solids are removed when the coagulated raw water passes upwards through the blanket. It is important to maintain a stable sludge blanket in order to achieve satisfactory removal of solids in the clarifier. However, plant operators experience difficulties in establishing and maintaining a stable sludge blanket due to varying raw water characteristics.

Understanding the factors affecting stability of the Sludge Blanket is essential for proper design and operation of the Clarifier. The parameter Sludge Cohesion Coefficient (SCC) was selected as the dependent variable for this study, while raw water turbidity, pH, temperature and coagulant dose were selected as water characteristics. Depending on the consistency of the sludge, SCC is reported to vary from 0.3 to 1.2, higher values (0.8 – 1.2) indicating quickly settled, consistent sludge and lower values indicating sludge with fragile flocculate.

An experiment was designed to test the SCC of different raw water samples. Sludge was prepared by the jar test procedure using seven raw water samples from three water treatment plants in Kandy. Thirty two sludge samples were extracted from the two pulsators of Kandy South plant. Eight sludge samples were prepared by the jar test procedure using synthetic raw water made of bentonite clay suspension. Part of the sludge sample prepared/ extracted from above methods was poured in to a 250 ml measuring cylinder and was allowed to settle for ten minutes after which excess sludge was siphoned off to leave an apparent sludge volume of 50 ml. A volume of 100 ml of the supernatant of beaker was poured to the cylinder through a funnel with an extended tube ensuring no air bubbles were drawn along. The apparent volume of the sludge and the time taken were recorded. The test was repeated with different flow rates. The SCC for coagulated raw water and pulsator sludge (39 samples) lay within the range 1.63 to 4.67 with a mean value (μ) 2.83 and standard deviation (σ) of 0.68, with 37 values belonging to the same sample within 95% confidence limit. All sludge samples were quick settling and consistent. However all the values were higher than the reported upper limit of SCC. The two values higher than the 95% limit were reported from the Gampola intake, which was observed to have higher organic matter content compared to the other two sources. Detailed analysis of variation of SCC with temperature when the coagulant dose is a constant, indicated that SCC reaches an optimum value at a particular temperature. For the synthetic sludge, SCC lay within 0.91 and 3.30, with $\mu = 2.58$ and $\sigma = 0.78$. All samples were quick settling and consistent, except for one having SCC below the 95% confidence limit, which was observed to have fragile flocculates. Highest SCC was observed at the optimum coagulant dose.