SOLAR RADIATION AND THERMAL EFFECTS ON SLUDGE BLANKET CLARIFIERS IN SRI LANKA

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Sludge Blanket Clarifier (SBC) is a very common and effective unit used in many water treatment systems in the world. Several types of SBCs could be seen in many water treatment plants in Sri Lanka and are getting more popular in modern plant designs. A common problem experienced by the maintenance staff pertaining to SBC is the sudden and extensive disturbances observed in these systems. These disturbances cause a fall in clarification efficiency and excessive filter clogging. It is a common opinion among the maintenance staff that these disturbances are caused by increases of ambient temperature and by direct solar radiation. Therefore this problem is more intense in tropical countries like Sri Lanka.

Our study was done on the Sludge Blanket Clarifying system in the Kandy Municipal Council (KMC) water treatment plant Gatambe. We have scrutinised the past records of disturbance in the system, and analyzed simulated sludge blanket in the laboratory for the effects of temperature and solar radiation (Global radiation). KMC treatment plant has a pulsator system, which is a slightly modified version of a sludge blanket clarifier. A SBC works on the principle that when a drag velocity and the settling velocity of a particle carried by a flow is equal that it should become stationary. In almost all the types of SBCs found in the world the flocs created by coagulation process is sent in an upward vertical flow where at a certain region these flocs become stationary and creates a cloud or blanket. By the improved collision and resistance provided by this blanket enhances the clarification capacity of a SBC in several folds than in a conventional settling tank. If this blanket gets scattered or disturbed due to some reason then it will directly affect the clarification capacity and the efficiency of the SBC. In our study we simulated a sludge blanket in the laboratory by sending the floc in an upward flow through a transparent vertical tube. This simulated sludge blanket was subjected to increments of inlet water temperature and solar radiation (SR) separately and outlet turbidity of the clarifier was tested accordingly. We assumed that the outlet turbidity was a direct measure of SB disturbance.

Our observations showed that, there is a clear and a predictable relationship of the parameters of temperature and global radiation with the outlet turbidity of the clarifier. When graphically illustrated the effluent turbidity clearly followed the variation of solar-radiation, it indicates a trend, but requires further investigation. One of the clearly established findings of our study was the relationship of the influent temperature with the effluent turbidity. In a separate test the residual aluminium levels of the clarified water using the spectrophotometer was tested and established that the residual aluminium levels are high on some days, which recorded SBC disturbances.

We conclude that temperature and solar radiation have an affect on the clarification capacity and the efficiency of an SBC, and is predictable. Hence it is advisable to keep SBC sheltered to avoid the direct exposure to sunlight, and thus to minimize disturbances.

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