Study of Convert Waste Stabilization Pond Geometry to Treated Wastewater Efficiency, (El-Burullus Lake, Egypt) As a Case Study

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Abstract*— The simulation of hydrodynamics water quality in ponds is a developing tool that worth studying in order to understand their internal processes and interactions. Pond design involves several physical, hydrological, geometrical, biological and dynamic variables to provide high hydrodynamic efficiency and maximum substrate utilization rates. Computational fluid dynamic modelling (CFD) allows the combination of these factors to predict the behavior of ponds by using different configurations. In this research mathematical model developed by Danish Hydraulic Institute (DHI), was formulated to simulate WQ parameter. This model was calibrated and used to simulate a scenario to improve study reach water quality in polluted lakes. The study applied on El-Burullus Lake, which is the second largest northern lake in Egypt which belongs to high eutrophic lake type and suffers from several problems. The model was run at steady and variable state with raw wastewater to study the real effect of the polluted drains, which discharge high amount of polluted wastewater into the El-Burullus Lake and know the lake situation after make baffles scenario. The major functions performed by baffles are to reduce hydraulic short-circuiting and to provide a submerged surface which can encourage the growth of attached biomass. Attached biomass growing on the surface of the baffles could increase the total mass of organisms in the pond and thus improve the treatment efficiency and therefore reduce the eutrophication rate in the pond such as (NH_3-N, PO_4-P & NO_3-N). Results showed that there are a significant variance between the rate of NH_3-N, PO_4-P & NO_3-N before and after make baffles, and the overlap between baffles (L=0.50 baffle) is more efficient than no overlap. In conclusion, waste ponds and be improved easily and economically to be more efficient by making baffles in the lake which can increase the water velocity, avoided the dead zones area and reduce the eutrophic concentration.

***Keywords*— Pond, Hydrological, Geometrical, Computational fluid dynamic, Modelling, Wastewater treatment, Baffles.**

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