



Experimental Study on the Efficiency of a Hydrosuction System for Desilting Sediment from a Farm Pond

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Sedimentation has been a crucial problem in the management of storage in farm ponds, which cuts down the capability of ponds in aspects of irrigation, flood detention, and water retention. The Hydrosuction sediment removal system features low energy consumption and reduction of structural modifications to the existing shaft, which is an economically feasible method to remove siltation in storage areas. However, the effect of desilting might be limited due to the position of inflow orifice of siphon-type pipe which controls the scope of desilting affected area. This study aims to enhance the desilting effect of a fixed siphon system through connected a designed drainage tube.

The experiments were conducted in a cubic tank with a volume of 1.0 m³. Inside the tank, a vertical square shaft with the height of 80cm connected to an outlet channel was placed, and the siphon-type pipe was arranged from the inner of the tank to the outlet channel along with the shaft with a 3.0 cm inner diameter. The tests were performed in two kinds of inflow conditions in three water heights (60, 70, 80 cm), one is constant head inflow condition for continuous inflow provided, the other is falling head inflow condition with limited inflow supply. The initially deposited depths of sediment varied from 30 or 40cm. The designed 24cm long tube which has three added upward orifices with two types of diameters (1.0, 2.0 cm) could be connected to the inflow orifice of the siphon pipe to compare the desilting effect with the original arrangement in the above flow conditions.

The experimental results revealed that the effect of desilting was promoted by the connection of the designed tube to the siphon system. Besides, the efficiency of desilting was affected by the sizes of discharge orifices on the designed tube in different inflow conditions. In the constant head inflow condition, the arrangement of the connected 2cm discharge orifice tube performed better results due to the larger amount of outflow induced by the larger orifice. On the contrary, the arrangement of the connected 1 cm discharge orifice tube had better desilting effect in falling head inflow condition induced by the longer time of disturbance between flow and sediment in smaller discharge. The results indicate that the capability and efficiency of sediment removal in the siphon system might be promoted by connecting an extended drainage tube with an appropriate size of upward discharge orifices.

