DEVELOPMENT OF A MODEL TO SELECT THE OPTIMUM SEDIMENTATION PROCESS IN SURFACE WATER TREATMENT

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University of Moratuwa

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Thesis submitted in partial fulfilment of the requirements for the Degree Master of Engineering

Department of Civil Engineering

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DECLARATION

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Prof. (Mrs.) Niranjanie Ratnayake

ABSTRACT

In the water treatment process, sedimentation is used to remove suspended particles from raw water, and sedimentation tanks have become a common structure at water treatment plants. Generally sedimentation tanks are made of reinforced concrete and may be rectangular, square or circular in plan.

With the advancement of technology, there are a number of sedimentation techniques now available. Some sedimentation tanks require coagulation and flocculation separately prior to the water enters the tank, while others provide the flocculation process within the tank by creating a velocity gradient using hydraulic or mechanical forces. The detention time of sedimentation tanks varies from thirty minutes to six hours depending on the sedimentation technique. This makes the sedimentation tank the largest and heaviest structure in the conventional water treatment plant.

According to the data available with the drinking water industry, construction cost for sedimentation tank and flocculator is about 25% to 35% of the total construction (civil works) cost of the water treatment plant.

Good engineering design should be economical. Unfortunately, based on experience in the potable water industry, the selection of the sedimentation technique mainly depends on the designer's experience and not based on an analysis of all relevant conditions affecting the economy of the tank throughout the design horizon.

Considering the operational cost, most local Engineers select sedimentation tanks operated by natural forces by gravitation and natural aggregation. A literature survey was carried out to find out the design practices on Plain Sedimentation, Clarifiers and Plate/Tube settlers. A field survey was also carried out to collect information on the construction and operation & maintenance costs of the tanks available within NWSDB. Furthermore a number of detailed designs were carried out to prepare cost estimates in order to supplement the collected data.

Based on this study, relationships were developed for cost functions and a method has been developed for the selection of an economical sedimentation technique depending on the capacity of the water treatment plant.

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