I INTRODUCTION

Surface water is one of an important supply for domestic, commercial and industrial water uses. The rapid expansion of water treatment plant is forced by rapid rate of urbanization, population and industrialization. Incidentally, the growth rate of developing countries are very high compared with developed countries. This factor aggravates the situation in these countries where water utilities are extremely deficient. Thus it is clearly that developing countries are faced with the problem of acute shortage of potable water and need to expand their facilities very rapidly for providing adequate amounts of clean water supplies. The increased water demand has made it necessary to re-evaluate conventional design criteria for various unit operations to reduce capital costs.

Sedimentation or settling tank is most widely used operation in the field of water and waste water treatment. The primary function of a settling tank is to seperate settleable and floatable solid from the liquid in which they have become suspended. Despite its wide spread use and importance, it is one of the areas of sanitary engineering field that has undergone very little change in the past 50 years except for the recent development of tube settler.

Commonly, sedimentation tank is carried out in large rectangular or circular basin which are designed to retain the average daily flow for period of 2 to 6 hours where the particles must settle through depths ranging from 10 to 15 feet (3 to 4.5 m.). A review of the basic fundamental of sedimentation by HAZEN (1904) revealed that the removal of settleable solids is a function of the surface overflow rate and is independent of the basin depth and detention time. It has been beleived for several years that an ideal settling basin should be as shallow as possible and that detention time could be reduced substantially by using closely spaced horizontal trays within a settling basin.

CAMP (1946) indicated that the use of very shallow trays in sedimentation basins enables the detention time of the settling process to be reduced to only few minutes in contrast to conventional settling process which required 10 to 30 times greater detention time periods, thus one obvious advantage development of a practical method of applying this theory offer tremendous potential for reducing the size and capital cost of construction, land and piping. These shallow trays or shallow gravitational settlers can be rectangular, circular or any other convenient shape. They can be horizontal or inclined. The shallow "depth" is usually not more than a few inches. HANSEN and CULP (1967) successfully demonstrated that, by using circular tubes of 0.5 to 4 inches in diameter (1.3 to 10.2 mm.) and up to 8 ft. (2.44 m.) in length., turbidity removal of as high as 96 percent could be obtained.

In case that the tubes were inclined at an angle of 60 deg., experimental results indicated that settled down sludge would slide down the invert of the tube on its own weight resulting in a self-cleaning system.

Purpose of the Research

Tube settler cross-sectional area can be circular, rectangular or even hexagonal. The materials used can be wood, steel or p.v.c. tubes. In Thailand, galvanized and asbestos cement corrugated sheet are ones of the local materials which can be found easily. These materials are reasonable low price compared with plastic corrugated sheet of same size.

Conventional sedimentation basin is usually constructed at depth of more than 10 ft. or 3 m.. Normally sedimentation basin have been made of reinforced concrete which is very expensive comparing with brickwork. If the depth of the basin is reduced to 1.5 metre, masonry wall can be applied without any leakage of water. In countryside or small community where water treatment plant is required, capital cost can be reduced by using high-rate settler in which modular construction uses corrugated sheet or any low cost material such as sundried-bamboo.

The purpose of the research are as follow:

1. . To study the performance of high-rate settler using corrugated sheet.

   a. To study the effect of flow rate, for various kind of settlers, on turbidity removal.

   b. To find the optimum tube length and size that can be used efficiently.

2. . To evaluate the feasibility in using corrugated sheet as a device for turbidity removal.

3. . To compare the construction cost of the conventional sedimentation tank to the sedimentation tank using tube settlers.

Scope of Research

The research was conducted in a pilot scale. The maximum surface area of the settling tank was 0.880 sq.ft. and the inclined angle of the settlers was fixed at 60 degree. Jar-test technique was run to determine the optimum alum dosage of the synthetic raw water. The performance of high-rate settler using corrugated sheet as a modular construction was evaluated using the independent variables:

a. Surface overflow rates, 1, 2, 3, 4.5 and 6 gpm./sq.ft.

b. Tube lengths, 1, 2 and 3 ft.

c. Tube size, small and medium corrugated sheet.

d. Tube material, galvanized steel and asbestos cement corrugated sheets.

Alum was used as a coagulant in all tests. The settling efficiency of tube settler was determined. Dependent variables were measured included turbidity and pH.