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PROCESS PERFORMANCE EVALUATION OF THE PRIMARY SETTLING TANKS IN NEW YORK CITY WPCPS

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EXTENDED ABSTRACT

The New York City Department of Environmental Protection owns and operates fourteen water pollution control plants designed to treat approximately 1.3 BGD (56.9 m^3/s). Thirteen of the plants are equipped with rectangular settling tanks. These tanks were sized primarily on the basis of overflow rate which varied from 1200 to 2100 gpd/sq.ft. (48.9 to 85.6 $m^3/d\text{-}m^2$). The flow into each tank consists of combined screened influent wastewater with returned plant sidestreams. The sidestreams consist of grit washwater, gravity thickener overflow, centrate, and other flows returned through the plant drains. Though of relatively small flow rates, in some plants sidestreams exert significant impact on the solids loading rate of the primary settling tanks. A comprehensive study was undertaken to assess the performance of the settling tanks as defined by the removal of SS and BOD. In this paper the effect of the charatersitics of the SS and overflow rate on the removal efficiency will be explored.

The study involved both bench-scale studies and full-scale evaluation of the primary settling tanks. The SS were first characterized by the fraction that was non-settleable. Using Standard Methods, the fraction of non-settleable SS for all plants averaged 40% of the total SS. The implication of this phenomenon is that the optimum removal of SS under quiscient conditions should be approximately 60%. Full-scale performance of the tanks showed that the actual removal of SS averaged at 50%. Therefore, it appears that the PSTs are performing at 83% of the optimum removal.

Consideration of the effect of overflow rate was based on settling velocities of the SS measured under quiscient conditions in 10 ft. (3.05m) Plexiglas columns. The data showed that within the previously stated range of overflow rates, the removal of SS remained relatively insensitive. Insignificant improvements may be realized at lower overflow rates. Thus the primary settling tanks appeared to operate well within the overflow rates experienced during the study. The variability in performance observed at a given overflow was related significantly to the concentration of the influent SS. For a given overflow rate, the removal of SS increased at the higher concentrations of SS.

Key words: gravity settling, non-settleable solids, settling velocities, primary settling tanks