

MATHEMATICAL MODELLING OF EFFLUENT QUALITY OF CHA-AM
MUNICIPALITY WASTEWATER TREATMENT PONDS SYSTEM USING
PCSWMM

ANUVA BHOWMICK 5737529 EGEW/M

M. Eng. (ENVIRONMENTAL AND WATER RESOURCES ENGINEERING)

THESIS ADVISORY COMMITTEE: RANJNA JINDAL, D.Tech.Sc.
KIMBERLEY IRVINE, Ph.D. KRITSANAT SURAKIT, Ph.D.

ABSTRACT

Water quality around Cha-Am, Thailand, is of prime concern because of its extensive oceanfront beach area. Cha-Am uses an aerated lagoon system consisting of three ponds and a natural wetland to treat the municipal wastewater. A personal computer version of the Storm Water Management Model (PCSWMM) was used to simulate the effluent quality of the treatment system.

Water quality sampling for Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN), *Escherichia coli* (E. coli), Chemical Oxygen Demand (COD), as well as evaporation measurements, were conducted on a bi-weekly basis for three months to calibrate the model. The four ponds were considered as four storage zones in the model. Based on the observed water quality data distribution, Monte Carlo simulation was used (1000 iterations, 20 times) to get the most probable input concentration for each pond to determine the appropriate treatment fractions for the model. Data on daily inflow rates, pump operation and bathymetric survey were obtained from the system operator as model input. The dynamic wave method was used with observed inflow rates to generate a continuous water quality simulation from July 19th to September 12th, 2015. The observed mean treatment efficiency was 51.9%, 77.3%, 99.6%, and 9.4%, after Monte Carlo simulation, the probable observed mean treatment efficiency was 53.4%, 77.9%, 100%, and 12.9% for TSS, TKN, E. coli, and COD respectively. The observed concentrations at the outlet ranged between, 10-25.5 mg/L, 0.98-3.92 mg/L, 0.1-260 CFU/100 ml, and 48-119 mg/L for TSS, TKN, E. coli, and COD respectively. The treatment fraction approach in PCSWMM was able to accurately represent the outlet concentrations of TSS, TKN, E. coli, and COD.

KEY WORDS: MATHEMATICAL MODEL / EFFLUENT QUALITY /
AERATED LAGOON / WASTEWATER TREATMENT
SYSTEM / PCSWMM

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