

THE PERFORMANCE OF SEPTIC TANKS

By

CHAMPIKA KARUNATILLEKE

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UOM Verified Signature

C Karunatileke

June, 1990

ABSTRACT

Every community produced both liquid and solid wastes. The liquid portion which is called wastewater may be defined as a combination of the liquid or water-carried wastes removed from residences, institutions, and commercial and industrial establishments. This wastewater renders potential threat to the environment. The problem due to domestic wastewater will be encountered at all places where human being dwell and this causes a great hazard.

The management of wastewater discharged from single houses, housing schemes, hotels, schools and other institutions which is not connected to central sewerage system due to high cost of providing sewers is a major problem in developing countries similar to Sri Lanka. Septic tank which does not rely upon abundant water or skilled attention is a very good solution to this problem.

The objective of a septic tank is to remove a high percentage of suspended solids, biochemical oxygen demand and pathogens. This is achieved by proper design and construction of the tank, considering the climatic and other site conditions. The objective of this research was to collect base-line data on the performance of septic tanks under tropical conditions by observing changes in wastewater quality and rate of accumulation of sludge in several selected septic tanks. The collected data would be useful in the evaluation of codes of practice for the design and maintenance of septic tanks under local conditions.

Four tanks in the Railway Quarters at Ratmalana and a communal septic tank at Kinderwatte Housing Scheme at Dehiwela were selected for the study. In addition to this performance of an upflow anaerobic filter connected to the communal septic tank was also studied. From these five tanks, one tank at Ratmalana was selected only for monitoring of depth of sludge. The preliminary studies of all the other tanks were carried out. After these studies, one tank from Ratmalana and the communal tank at Dehiwela were selected for detailed studies.

In both of these studies, biochemical oxygen demand (BOD), chemical oxygen demand (COD), suspended solids (SS), and bacterial counts (faecal and total coliforms) of the liquid inside first and second compartments of each tank were determined. In the preliminary studies of communal tank, samples were collected only from the first compartment.

In the preliminary studies, the variation within a very short time interval and hourly variation of parameters were studied, whereas in the detailed studies the data were analysed to find the removal efficiencies of each parameter and also some correlations were obtained between removal efficiencies with loading rates and rate of wastewater flow.

The performance of upflow filter was studied under detailed studies.

It was found that the characteristics of wastewater within a septic tank has a very high variation within a short period of time. The hourly variation of parameters did not appear to follow a common pattern among the tanks.

From the two tanks selected for the detailed studies a consistently better performance was observed in the communal tank.

The sludge accumulation rates (calculated from depth of sludge measurements) of 9, 12, 21 and 20 l/pa were observed in the first compartment of Tank Nos. 1,2 and 4 at Ratmalana and in communal tank at Dehiwela respectively.

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NOTATIONS

BOD	-	Biochemical Oxygen Demand (5 days)
°C	-	Centigrade
COD	-	Chemical Oxygen Demand
d	-	Days
DO	-	Dissolved Oxygen
ft	-	Feet
g	-	Grams
G.I.	-	Galvanized Iron
h	-	Hours
in	-	Inches
Kg	-	Kilogram
Kg COD/m ³ d	-	Kilogram of Chemical Oxygen Demand per Cubic Meter Per Day
kg/l	-	Kilogram per Liter
kgSS/m ³ d	-	Kilogram of Suspended Solids per Cubic Meter per Day
l/pa	-	Liters per Person per Annum
l/pd	-	Liters per Person per Day
m	-	Meters
m ²	-	Square Meters
m ³	-	Cubic Meters
mg/l	-	Milligram per Liter
ml	-	Milliliters
m ³ /pa	-	Cubic Meters per Person per Annum
m ³ /pd	-	Cubic Meters per Person per Day
MPN	-	Most Probable Number
P	-	No. of Users

- PVC - Poly Vinly Chloride
- r - Coefficient of Correlation
- SS - Suspended Solids
- TWL - Top Water Level
- W - Width of Septic Tank