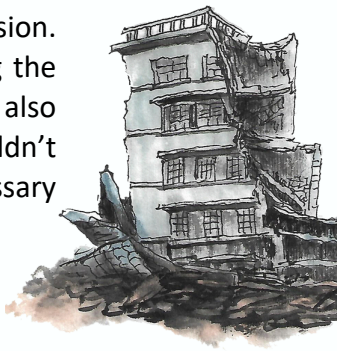
DESIGN OF WASTEWATER TREATMENT FOR EN4 BUILDING

Group ENV07: Parinya Phale , Jirawan Wiansanthai , Methawee Mongkolmafai

Introduction

EN04 building has faced significant structural subsidence from wastewater erosion. Transitioning to an aerobic treatment system could decrease methane emissions, aiding the faculty's greenhouse gas reduction goals and couldn't only properly treat wastewater but also decrease methane emissions. In addition, current wastewater treatment system couldn't achieve current discharge standard of the building. This upgrade is the final necessary improvement for the facility.

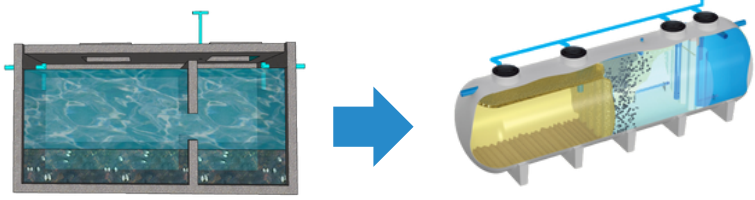


Problems

- A septic tank can lead to building subsidence due to the absorption of wastewater.
- The discharge of wastewater doesn't meet the standards set forth in Category B of the Ministry of Natural Resources and Environment Act (B.E. 2548).

Sources of Wastewater in EN04

Conceptual Design



The traditional septic tank - seepage pit system will be replaced with a fixed-film aeration tank to prevent subsidence of the EN04 building. This upgraded system is not only more efficient but also contributes to environmental sustainability.

Advantages

A Fixed-film aeration tank

- High Efficiency
- Lower Energy Consumption
- Compact Design
- Stable Performance

Disadvantages

A Fixed-film aeration tank

- High Initial Cost
- Difficult Maintenance
- Clogging
- Load Sensitivity

Design

The Computer Engineering Department (EN04)

- Wastewater flowrate : 42.34 m^3/d
- BOD Influent : 2,900.00 mg/l

The Electrical Engineering Department (EN04)

- Wastewater flowrate : 36.99 m^3/d
- BOD Influent : 2,900.00 mg/l

Design Criteria

- **BOD Effluent** : < 30 mg/L
- **Hydraulic retention time (HRT)** : 6-24 h
- **Maximum growth rate (μ_{max})** : 0.80 - 1.20 d^{-1}
- **Half-saturation constant (K_s)** : 40 - 60 mg/L
- **Microbial yield coefficient (Y)** : 0.40 - 0.60 mg/mg
- **Organic Matter Decay Rate (k_d)** : 0.05 - 0.10 d^{-1}

Metcalf & Eddy (2003) **Wastewater Engineering: Treatment and Reuse. 4th Edition, McGraw-Hill, New York.**

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Flow Diagram

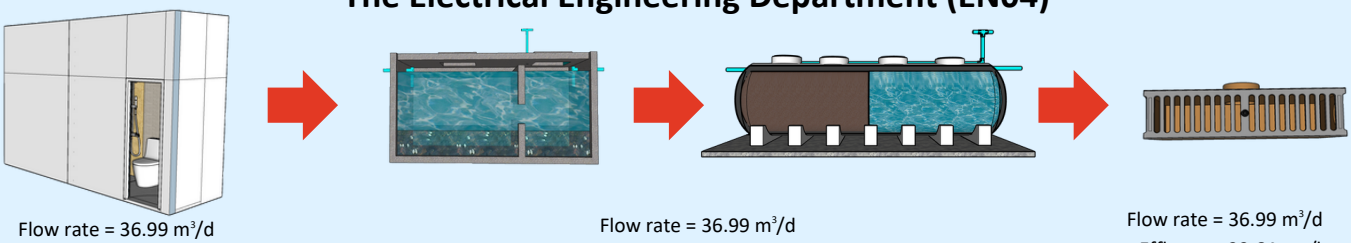
The Computer Engineering Department (EN04)

Flow rate = 42.34 m^3/d
BOD Influent = 2,900.00 mg/l

Flow rate = 42.34 m^3/d
1,160.00 mg/l

Flow rate= 42.34 m^3/d
Effluent = 24.05 mg/l

The Electrical Engineering Department (EN04)

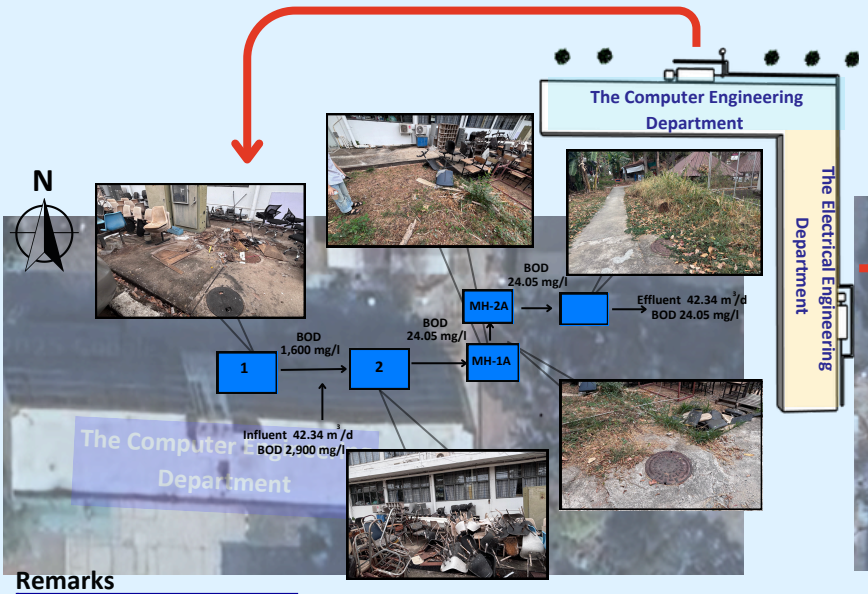


Flow rate = 36.99 m^3/d
Influent = 2,900.00 mg/l

Flow rate = 36.99 m^3/d
1,160.00 mg/l

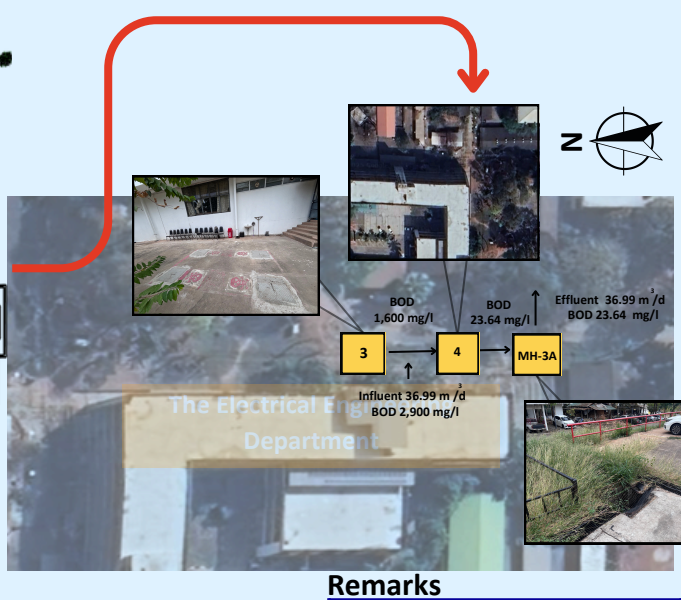
Flow rate = 36.99 m^3/d
Effluent = 23.64 mg/l

Plan Layout and Location



Remarks

1	CoE Septic tank - Seepage pit system
2	CoE Fixed-Film Aeration Tank
MH-1A	New manhole
MH-2A	Old manhole



Remarks

1	EE Septic tank - Seepage pit system
2	EE Fixed-Film Aeration Tank
MH-3A	Old manhole from Faculty of Architecture

Result

The wastewater treatment system design has a budget of **1,829,421.62 THB,** excluding structural assessment. Key tasks involve construction, sanitation upgrades, and tank installation, with costs calculated using **Factor F of 1.3061**, which includes materials, labor, and a 7% loan interest. Oversight is provided by the Faculty of Engineering.

The Computer Engineering Department (EN04)

- Efficiency : 97.93%

The Electrical Engineering Department (EN04)

- Efficiency : 97.96 %