

ENVE 302 Term Project 3 (2011-2012)

In the scope of this project, each group will prepare the detailed design of the following units for the given influent characteristics.

The project report will be submitted on **25.05.12**. Presentation hours will be announced later.

The design will include the detailed process calculations for the following units:

1. Conventional activated sludge system including both carbon removal, nitrification and denitrification

For denitrification, pre-anoxic configuration should be considered

The oxygen calculations submitted in the previous project (conventional activated sludge system including carbon removal and nitrification) should be revised by considering the saving due to denitrification process

The alkalinity calculations submitted in the previous project should be revised by considering denitrification.

All drawings should be revised

2. Secondary clarifiers

DRAWINGS TO BE SUBMITTED:

For each process unit, the following scaled Autocad drawings will be prepared:

1. Plan view
2. Cross-section
3. Longitudinal section (if applicable)

A layout showing oxic basins, anoxic basins and secondary clarifiers, distribution chambers and pipe connections between tanks should be submitted.

Each drawing will include a legend. The legend will consist of at least the followings:

- Drawing name
- Group name
- Scale of drawing

On each drawing, the dimensions will be shown in mm.

The report will include the following sections:

- Cover Page
- Content page

- Executive summary
- Brief description of process
- Detailed process calculations
- Selection of necessary equipment (e.g, WAS pumps, RAS pumps, blowers, diffusers etc.)
- Reference list (All references listed here will be referred in the report)
- Appendixes: Source code of all computer programs to be used, Drawings (should be inserted in a clear file)

Layout of the proposed plant

Summary tables given on pages 4 and 5

Influent Characteristics :

Average daily flowrate : 15 000 m³/day
 Peak daily flowrate : 20000 m³/day

BOD : 300 mg/L
 COD : 600 mg/L
 TSS : 400 mg/L
 TKN : 70 mg/L
 NH₄-N : 45mg/L
 Org-N : 25 mg/L
 TP : 10 mg/L
 Alkalinity : 170 mg/L as CaCO₃

Wastewater Temperature

Min. Temp. : 14 °C
 Max. Temp. : 24 °C

Ambient Temperature

Min. Temp. : 12°C
 Max. Temp. : 29°C

Altitude of the treatment plant site: 150 m

EFFLUENT PARAMETERS

BOD ≤ 25 mg/L
 TSS ≤ 35 mg/L
 NH₄-N < 0.5 mg/L
 Organic N < 2.0 mg/L
 NO₃-N ≤ 7.5 mg/L
 Total N ≤ 10 mg/L
 Total P ≤ 3 mg/L

OXIC AND ANOXIC BASINS

| PARAMETERS | |
|--|--|
| Q design (m3/d) | |
| Design temperature (0C) | |
| DO conc. in the tank, mg/L | |
| effluent C conc. (g/m3) | |
| effluent N conc. (g/m3) | |
| Minimum required sludge age,day | |
| Design sludge age, day | |
| P x, biomass (kg/day) | |
| Px, VSS (kg/day) | |
| Px, SS (kg/day) | |
| MLSS, mg/L | |
| MLVSS, mg/L | |
| Total oxlic volume, m3 | |
| number of tanks | |
| volume of each tank(m3) | |
| tank dimensions | |
| width (m) | |
| length (m) | |
| depth (m) | |
| SVI (ml/g) | |
| X _R (mg/L) | |
| R | |
| % solids in RAS | |
| RAS PUMPS | |
| Number | |
| Capacity (m3/d) | |
| WAS Pumps | |
| % solids in WAS | |
| Number | |
| Capacity (m3/d) | |
| Oxygen calculations | |
| Temperetaure, 0C | |
| AOTR (kg/hr) | |
| O2. req for carbon removal, kg/hr | |
| O2. req. For nitrification, kg/hr | |
| O2 eqv.of biomass wasted, kg/hr | |
| O2. Saving from denitrif., kg/hr | |
| SOTR (kg/hr) | |
| number of blowers | |
| capacity of each blower (m3/hr) | |
| total blower capacity (m3/hr) | |
| Total number of diffusers | |
| Number of diffusers in each tank | |
| For anoxic volume | |
| Nitrate effluent , mg/L | |
| Nitrate nitrogen to be denitrified, mg/L | |
| Active biomass conc, mg/L | |
| Min. Required SDNR (g/g.d) | |
| Internal Recycle ratio(IR) | |
| IR pumps | |
| Number | |
| Capacity (m3/d) | |
| Assumed HRT , hr | |
| Total Anoxic volume, m3 | |
| F/M | |
| rbCOD/bCOD (%) | |
| SDNR capacity at 20 degrees celcius | |
| SDNR cap. corrected for T | |
| SDNR cap. corrected for IR | |
| Designed SDNR cap. (g/g.d) | |
| SDNR cap/SDNR req | |
| number of tanks | |
| volume of each tank(m3) | |
| tank dimensions | |
| width (m) | |
| length (m) | |
| depth (m) | |

SECONDARY CLARIFIERS

| PARAMETERS | |
|---|--|
| Q ave(m ³ /d) | |
| Q peak(m ³ /d) | |
| number of tanks | |
| Q ave per tank (m ³ /d) | |
| Q peak per tank (m ³ /d) | |
| tank shape | |
| tank dimensions | |
| for rectangular | |
| width (m) | |
| length (m) | |
| depth (m) | |
| for circular | |
| diameter (m) | |
| depth (m) | |
| surface area of each tank (m ²) | |
| volume of each tank (m ³) | |
| Recycle ratio | |
| Q recycle per tank at Qave | |
| Q recycle per tank at Qpeak | |
| overflowrate (m ³ /m ² /d) | |
| for Qave | |
| for Qpeak | |
| MLSS (mg/L) | |
| solids loading (kg/m ² /d) | |
| for Qave | |
| for Qpeak | |
| surface loading (m ³ /m ² /d) | |
| for Qave | |
| for Qpeak | |
| weir loading (m ³ /m/d) | |
| for Qave | |
| for Qpeak | |
| HRT (hr) | |
| for Qave | |
| for Qpeak | |