Start- end date: 28 August 2019- 28 January 2020	avans hogeschool	UFV UNIVERSIDADE FEDERAL DE VIÇOSA
Student name: Luc Penson		
Course in the Netherlands: Chemical Engineering		
Internship Department/Company: UFV (LESA)		
Brazilian Professor/Supervisor: Ann Mounteer		
Dutch Professor/Supervisor: Qian Zhou		
Internship		

Problem / assignment

The city has two small wastewater treatment plants near municipal water sources, but treated wastewater is still too toxic. Chemical substances such as ammonia, estrogen and sulfide are found at concentrations above legal limits according to previous tests.
There is no budget now available from the wastewater plant, however, a bench-scale Upflow Anaerobic Sludge Blanket reactor (UASB-reactor) is being operated at the Civil Engineering Department/UFV to study ways to decrease the toxicity of the wastewater. The recommendation of the previous project was adding an aerobic treatment after the treatment in the UASB-reactor, due to a relatively high concentration of toxic substances in the treated waste water.
The objective was to evaluate the performance of an aerobic filter bioreactor with ceramic rings as biofilm support. The total suspended solids (TSS), phosphorous (P), ammonia (NH_3), biological (BOD) and chemical (COD) oxygen demands will be determined before and after the aerobic bioreactor. Bioreactors of different volumes (hydraulic retention times) and surface areas (overflow rates) will be used to define the best performance conditions.

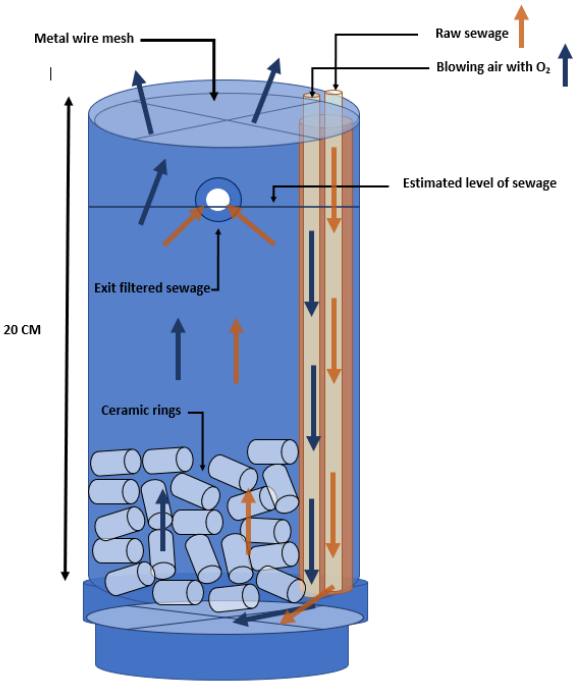
Used methods / project phases

The methods that were used can be considered as 'experimental setup' and 'analytical methods':
Experimental setup
Three bioreactors were made from PVC with different hydraulic retention times. In all of the reactors, a certain amount of ceramic rings and air stones were placed to supply oxygen in the water what together accumulate the aerobic bacterial growth.
Analytical methods
The experiments that were done were Biological Oxygen Demand, Chemical Oxygen Demand, Kjeldahl Nitrogen test, Suspended solid test and Phosphor test.

Results

The performance of an aerobic bioreactor as a post-treatment for anaerobic treated raw sewage is in general positive. Using the bioreactor to treat raw sewage decreased the BOD, ammonia, phosphorous and suspended solids by 80%, 67%, 42% and 67%, respectively. All of the highest reductions were found in the Long-reactor. The long reactor had the highest hydraulic retention time and access to oxygen. Having more oxygen in the reactor will increase the performance of the aerobic bioreactor. Using ceramic rings combined with air stone(s) inside the bioreactor is a working method grow aerobic bacteria that reduce the BOD, ammonia and phosphorous.

Results
Further research is necessary to improve the process and reduce the variability found during this study.

Extra info / advice / link to final document and presentation
To used my report for any purpose, please contact my Professor Ann. Figure below is the used sketch of the biological filter:    Figure below is the experimental setup used in Brazil: