FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF WATER RESOURCES ENGINEERING

DESIGN AND CONSTRUCTION OF AN AUTOMATIC URINE DIVERSION FLUSH URINAL AND THE WASTEWATER RECYCLING

(Case study: Busitema university flush urinals)

OCITTI GERALD

BU/UP/2018/3667

Email: hocittygeraldoh@gmail.com

Contact:0778551947/0771438355

Supervisor; Mr. Wangi Mario

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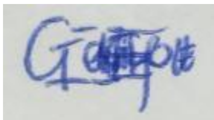
Abstract

A flush urinal disposes human urine by using water through a pipe line to the sewage. A number of urinals installed in offices, educational institutions and other public places have manual flushing system like push button, trigger etc. These urinals mix human urine and the flush water and convey them to the sewage system, limiting stream segregation management of wastewater. About 40 litres of water and 14 litres of urine drains to the sewage per day per urinal. The present invention relates to a specially designed automatic urine diversion flush urinal and the wastewater recycling. Its mechanism of operation utilizes a sensor to detect presence of a user to open a control valve which allows urine to flow to its storage and closes it at flushing when the user leaves. The system allows for the use of a specified quantity of water to prevent odour and scale build up in the system. It ensures separate collection of urine (nutrient resource for soil enrichment/ fertilizer industry) and wastewater which is recycled through a treatment process. it also ensures compulsory and un-intentional flushing of urinal which conserve water at the same time it is cheap, which can be fitted or retrofitted on new as well as existing urinal systems. The dilute yellow collected from the urinal system is treated to reuse it as flushing water effectively. An existing methodology is used to treat the yellow water focusing on three parameters, odour, colour and nutrients for the safety reuse of treated yellow water. The treatment process consists of Aeration, filtration (carbon filter and sand filter) and disinfection.

Declaration

I **Ocitti Gerald,** certify that all the information presented in this project report is original and has never been submitted for the granting of a degree, certificate, or diploma to any university or other higher education institution**.**

Signature; 

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Approval

This is to confirm that the project report was completed under my guidance and is prepared for submission to the Busitema University Senate and Board of Examiners with my approval.

Supervisors

Mr. WANGI MARIO

Signature. 

Date. 13 / Jan / 2023

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Chapter one

1 Introduction

1.1 Background

The population of the world is growing and migrating to cities. In emerging nations, where an additional 2.5 billion people are anticipated to live in cities by 2050, this trend is particularly pronounced(Leeson, 2018). Every year, these cities produce billions of tons of waste, including sludge and wastewater from home and industrial processes(Drechsel et al., 2015).

In Uganda large volume of sewage is transported to a centralized wastewater treatment plant for purification, large infrastructures are required which are expensive to set up(Fuhrimann et al., 2014). Domestic activities generate most of the waste in the sewage i.e. about 7.62million m^3/ year of wastewater(Kiggundu, 2017). With the increasing adoption of modern flush type of sanitation system, the nutrients and pharmaceuticals present in excreta are adversely polluting the environment as waste water effluent discharge. Although urine only makes up about 1% of wastewater entering treatment plant, it is the main source of pharmaceuticals in municipal wastewater and it contributes 80% of the nitrogen and 50% of phosphorous load. From useful resource perspective, the mixing of different flows in these systems reduces the possibility of reuse of water. Besides the nutrients present in yellow wastewater cannot be utilized for soil enrichment(Md Azizur & Sakthivel, 2015). In the mixed flow system, urinals with low flush water do not provide enough water to fully wash the urinal. As this high water and urine concentrate sit in the pipes, an extremely hard, cement like sediment accumulates and clogs the pipe(Hashemi et al., 2015).

The charge on a cubic meter of water is Ug shs 3065 by NWSC and Ug shs 4000 by private operators, the cost including 18% VAT and Ug shs 1500 service fee amounts to Ug shs 15,896(Republic, 2020).

About 657m^3/year of water is required to flush the urinals at the main campus of Busitema University, and the wastewater is transported down the sewer system to the lagoon for first treatment before being discharged into the Busitema stream. Due to the high unit cost associated with a cubic meter of water, maintaining this system costs a lot of money. In addition, this effluent contains all of the nutrients found in urine, including pharmaceuticals, which are the main contributors to eutrophication of water bodies and environmental contamination when they enter

5.3 References

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