On-site integrate management of hospital wastewater: The case study of a pilot scale unit at a General Hospital in Crete

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ΔΙΑΝΥΑ

Introduction

Hospitals are one of the main sources of pharmaceuticals pollutant emissions sent to wastewater treatment plants (WWTP) that are poorly equipped to treat efficiently these types of compounds.
Hospital wastewater, in addition to conventional urban wastewater pollutants (BOD_5, COD, TSS, NH_4-N, TP), also contains a wide variety of micro-pollutants including widely used pharmaceutical compounds (such as analgesics, anti-inflammatory, antibiotics), specialized chemicals for the treatment of specific diseases (e.g. cytostative compounds), disinfectants as well as multi-resistant bacteria.

Figure 04: Advanced oxidation unit (UV, H_2O_2)

Description and Operation

The pilot plant for the treatment of hospital wastewater includes the following distinct stages of processing:

► Reservoir for the collection and supply of hospital wastewater
► Anaerobic fluidized bed reactor unit (AnMBBR)
► Aerobic biological treatment unit with the method of immersion biomembrane (MBR)
► Advanced oxidation unit using ultraviolet radiation (UV) and addition H_2O_2
► Chlorine disinfection unit

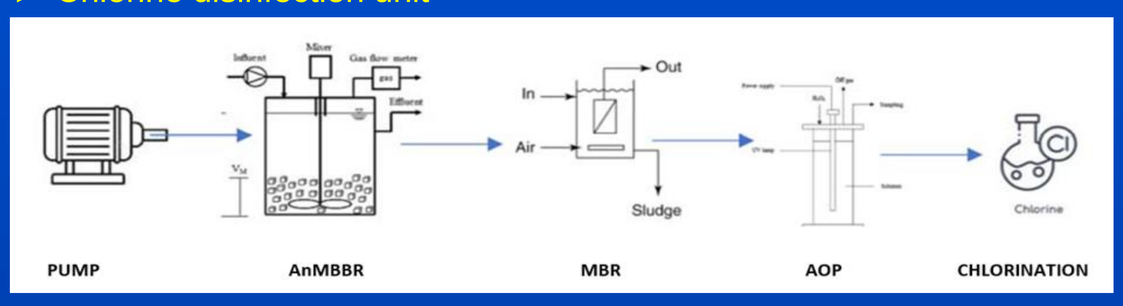

Figure 01: Hospital wastewater pilot plant unit flowchart

Figure 02: Anaerobic fluidized bed reactor unit (AnMBBR)

Figure 03: Aerobic biological treatment unit with bio membranes (MBR)

The hospital wastewater that will supply the pilot plant will be pumped from an inlet shaft of the existing WWTP through its submersible pump construction house. Hospital wastewater from the inlet vessel through a screw pump will feed the anaerobic fluidized bed reactor (AnMBBR), with suitable biocarriers (40%), with system for controlling the temperature (40 ºC), on-line pH and temperature measurement sensor and miligascounter gas flow meter of low and maximum level. The Hospital wastewater after the anaerobic reactor will enter the ventilated reactor of immersion ultrafiltration membranes (MBR) [double-walled cylindrical anaerobic reactor total volume 2000 L with ultrafiltration membrane (porous ≈ 0.04 μm) hydrophilic].
The advanced oxidation plant will consist of an H_2O_2 storage tank, disinfection system with UV lamps and recirculation pump. A 200L plastic tank collects the outflow of MBR. The disinfection system (UV) will be supplied by this tank. The dosing of H_2O_2 will be done before entering the UV while the outflow from this it will turn back to the supply tank thus ensuring time stay in the closed circuit of the system.
From this container there is an overflow of the tertiary most processed outflow towards the system of static chlorinator. Using the above layout, it is possible to dosing and solid catalyst which will be recirculated within the system container – UV and could be removed from the container.

Figure 05: Pilot scale unit at a General Hospital Crete, Greece

Expected Results

The construction and the operation of the pilot scale hospital wastewater unit at the General Hospital of Heraklion will offer integrated wastewater management. Also, the hospital wastewater will be effectively treated by producing, simultaneously, biogas and recovered water. Additionally, it will be well studied the possible removal of multi-resistant bacteria, resistance genes and organic micro-pollutants for the reuse of treated hospital wastewater at hospital gardens. Finally, the last expected result is the economic and technical evaluation of the proposed hospital wastewater treatment unit to accelerate the commercialization process of the technology.

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