



Decentralized Greywater Treatment using a Novel Electrochemical Approach

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Summary of Abstract

Despite its many advantages, decentralized greywater treatment has not had a rapid or extensive uptake. Challenges can include harvesting of greywater, system maintenance, treated greywater quality, and use of treated greywater. A novel low-maintenance system based on electrochemical approaches that has been field tested and conforms to NSF/ANSI 350 performance requirements will be presented.

Learning Objectives

Participants will learn about:

- A compact electrochemical unit that replaces chemical coagulation, flocculation and sedimentation
- An electrochemical approach to disinfecting greywater that does not require chemical addition
- A unique approach to harvesting greywater
- Why greywater treatment and reuse is of interest even in northern communities in Canada
- Why greywater treatment and reuse is of interest in commercial buildings in Canadian cities
- Results from field trials in various locations and settings
- A unique and rapid (15 min) approach to measuring COD using commercially available technology

Abstract

Decentralized greywater treatment is an alluring concept. The decentralized approach eliminates the need to pump greywater to and from a centralized treatment facility, and thus can result in important energy savings. However, the decentralized approach typically implies the greater involvement of system owners, who are often responsible for the maintenance and oversight of the system once it has been acquired. Thus despite the allure, and the fact that international plumbing codes have now adopted greywater treatment standards, the uptake of decentralized greywater treatment systems able to meet these standards has not been rapid or extensive, even in regions of water scarcity. Significant efforts are however being made, for example the San Francisco OneWaterSF initiative to name only one.

Challenges for decentralized greywater treatment systems beyond maintenance and consumables also include greywater harvesting, and competition from simple systems that produce partially-treated greywater at lower capital and operating costs. While the partially-treated greywater can be used for some applications, these are often limited. Even the use of fully treated greywater can be challenging in some locations.

A novel greywater treatment system based on electrochemical approaches has been developed. The system does not rely on chemical addition or biological treatment, and does not make use of filters or membranes. Because of this, and the fact that the system is automated and has a daily self-cleaning cycle, the maintenance requirements are very low (once every 3 months) and the system does not require an operator. As well, the system has on/off capability (since it is not based on biological treatment), which means that it operates when greywater is available and is on standby when it is not. Furthermore, the system can treat both shower/bath greywater and laundry water. The higher concentration of laundry greywater and the lint contained in this stream can be a challenge for many greywater treatment systems.

The system can be coupled with a unique approach to harvest greywater in buildings where extensive plumbing modifications might otherwise be required. The system has been field tested in various locations in Canada including a remote eco-chalet, a college, and a multi-occupancy building in Nunavut. It will be shown that there are regions that do not suffer from water scarcity that are still highly motivated to treat and reuse greywater.

The novel greywater treatment system meets the performance requirements of NSF/ANSI 350 as determined during a 6 month trial. The system is scalable and is suitable for decentralized greywater treatment applications in homes, multi-occupancy buildings, and commercial enterprises. A techno-economic sensitivity analysis will be presented for various scenarios. The use of a unique set of analytical instruments for greywater characterization in the field will also be discussed.