Water Sci Technol. 2014; 69(6):1282-8. doi: 10.2166/wst.2014.016.

Effect of anaerobic digestion at 35, 55 and 60 °C on pharmaceuticals and organic contaminants.

Davidsson A[1], Kjerstadius H[1], Haghighatafshar S[1], Fick J[2], Olsson M[3], Wachtmeister H[3], Eriksson E[3], la Cour Jansen J[1].

Abstract

The application of treated sewage sludge on farmland is a suggested method for recycling nutrients and reducing demand for commercial fertilizer. However, sludge needs to be safe from possible contaminants which can cause acute and long-term health and environmental problems. Residual pharmaceuticals and organic contaminants are mentioned as emerging threats since wastewater treatment plants are not designed to degrade these substances. The aim of this study was to screen and evaluate the presence, and reduction, of pharmaceuticals and polycyclic aromatic hydrocarbons (PAHs) during anaerobic digestion of mixed primary and waste-activated sludge at 35, 55 and 60 °C and during pasteurization at 70 °C. The study showed the difficulty of analysing pharmaceutical compounds in low concentrations in the sludge matrix. No general reduction of these compounds was seen during treatment, but for individual substances some reduction occurred. The PAHs were generally not reduced during digestion or pasteurization, but for three substances (indeno[1,2,3-cd]pyrene and dibenzo[a,h]anthracene (analysed together) and benzo[g,h,i]perylene) reduction (up to 60%) during digestion was seen. Digestion at 35 and 55 °C resulted in about the same order of reduction of the three individual PAHs, which was higher than for digestion at 60 °C.

PMID:
24647195
[PubMed - indexed for MEDLINE]
>>>>>>>>>>>>>>>>>>>>

Environ Technol. 2014 Mar-Apr;35(5-8):637-44.

Septic wastewater treatment using recycled rubber particles as biofiltration media.

Oh JH, Park J, Ellis TG.

Abstract

Performance of the laboratory-scale recycled rubber particles (RRP) biofilter was compared to a conventional gravel system and a peat biofilter for treatment of septic tank effluent. During the study, the RRP biofilter provided similar or better performance than other systems in terms of organic removal and hydraulic capacity. After the start-up

period, RRP biofilter achieved removal efficiencies for BOD5, total suspended solids (TSS), ammonia nitrogen of 96%, 93%, and 90%, respectively, over the range of hydraulic loading rates of 57-204 L/m2/d. On the other hand, the peat biofilter failed hydraulically and the gravel system showed high TSS concentrations in the effluent. RRP provided high surface area and sufficient time for biological treatment. In addition, RRP was observed to provide ammonia adsorption capacity. The results showed that RRP has the potential to be used as substitutes for natural aggregate such as gravel in septic system drainfields. The RRP biofilter can be used as alternative septic systems for the sites where an existing septic system has failed or site conditions, such as high groundwater table or small lot size, are not suitable for the installation of conventional septic systems.

PMID:
24645443
[PubMed - indexed for MEDLINE]

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Sci Technol. 2014;69(2):350-7. doi: 10.2166/wst.2013.720.

The effect of aeration and effluent recycling on domestic wastewater treatment in a pilot-plant system of duckweed ponds.

Ben-shalom M[1], Shandalov S[1], Brenner A[1], Oron G[2].

Author information

Abstract

Three pilot-scale duckweed pond (DP) wastewater treatment systems were designed and operated to examine the effect of aeration and effluent recycling on treatment efficiency. Each system consisted of two DPs in series fed by pre-settled domestic sewage. The first system (duckweed+ conventional treatment) was 'natural' and included only duckweed plants. The second system (duckweed aeration) included aeration in the second pond. The third system (duckweed+ aeration+ circulation) included aeration in the second pond and effluent recycling from the second to the first pond. All three systems demonstrated similarly efficient removal of organic matter and nutrients. Supplemental aeration had no effect on either dissolved oxygen levels or on pollutant removal efficiencies. Although recycling had almost no influence on nutrient removal efficiencies, it had a positive impact on chemical oxygen demand and total suspended solids removals due to equalization of load and pH, which suppressed algae growth. Recycling also improved the appearance and growth rate of the duckweed plants, especially during heavy wastewater loads.

PMID:
24473305
[PubMed - indexed for MEDLINE]

>>

Water Sci Technol. 2013;68(12):2645-53. doi: 10.2166/wst.2013.545.

Application of the analytic hierarchy process to the analysis of wastewater nutrient recycling options: a case based on a group study of residents in the city of Zurich.

Contreras F[1], Hanaki K[1], Aramaki T[2], Binder CR[3].

Author information

Abstract

The recycling of anthropogenic nutrients derived from the wastewater management systems is often characterized by a complex and uncertain scenario, due not only to the nature of the process but also to the involvement of different stakeholder groups. Over the past 10 years in Switzerland, policies regarding the use of sewage sludge as fertilizer have gradually shifted to a ban on use in agriculture. As a result, alternative methods for the recycling of anthropogenic nutrients may play a relevant role in the near future. This paper uses the analytic hierarchy process (AHP) to examine more closely the nutrient-recycling dilemma by analysing the preferences of a group of German-speaking residents in the city of Zurich for various management scenarios. Nutrient recycling by the use of urine separation toilets and the BioCon treatment process are presented as possible management alternatives in addition to current practice. The study shows that AHP can incorporate the respondents' preferences and multiple objectives when evaluating alternatives with different attributes.

PMID:
24355853
[PubMed - indexed for MEDLINE]

>>

Environ Technol. 2013 May-Jun;34(9-12):1385-92.

Grey water treatment at a sports centre for reuse in irrigation: a case study.

Gabarró J[1], Batchelli L, Balaguer MD, Puig S, Colprim J.

Author information

Abstract

Grey water has long been considered a promising option for dealing with water scarcity and reuse. However, factors such as lack of macronutrients and low carbon content

make its treatment challenging. The aim of this paper was to investigate the applicability of sequencing batch reactor (SBR) technology to on-site grey water treatment at a sports centre for reuse in irrigation. The results demonstrated that the regenerated water complied with microbiological parameters concerning restriction of solids and organic matter removal. Denitrification was not fully accomplished, but ammonium was totally oxidised and low concentrations of nitrates were achieved. Effluent with good appearance and no odour was used in an experimental study to irrigate a grid system containing natural and artificial grass sections. The conclusion is that SBR technology offers a promising treatment for grey water.

PMID:
24191471
[PubMed - indexed for MEDLINE]

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Sci Total Environ. 2013 Sep 1;461-462:723-33. doi: 10.1016/j.scitotenv.2013.05.059. Epub 2013 Jun 14.

Pathogen reduction requirements for direct potable reuse in Antarctica: evaluating human health risks in small communities.

Barker SF[1], Packer M, Scales PJ, Gray S, Snape I, Hamilton AJ.

Author information

Abstract

Small, remote communities often have limited access to energy and water. Direct potable reuse of treated wastewater has recently gained attention as a potential solution for water-stressed regions, but requires further evaluation specific to small communities. The required pathogen reduction needed for safe implementation of direct potable reuse of treated sewage is an important consideration but these are typically quantified for larger communities and cities. A quantitative microbial risk assessment (QMRA) was conducted, using norovirus, giardia and Campylobacter as reference pathogens, to determine the level of treatment required to meet the tolerable annual disease burden of 10(-6) DALYs per person per year, using Davis Station in Antarctica as an example of a small remote community. Two scenarios were compared: published municipal sewage pathogen loads and estimated pathogen loads during a gastroenteritis outbreak. For the municipal sewage scenario, estimated required log10 reductions were 6.9, 8.0 and 7.4 for norovirus, giardia and Campylobacter respectively, while for the outbreak scenario the values were 12.1, 10.4 and 12.3 (95th percentiles). Pathogen concentrations are higher under outbreak conditions as a function of the relatively greater degree of contact between community members in a small population, compared with interactions in a large city, resulting in a higher proportion of the population being at risk of infection and illness. While the estimates of outbreak conditions may overestimate sewage concentration to some degree, the results suggest that additional treatment barriers

would be required to achieve regulatory compliance for safe drinking water in small communities.

>>

Science. 2012 Aug 10;337(6095):681-6. doi: 10.1126/science.1216852.

Taking the "waste" out of "wastewater" for human water security and ecosystem sustainability.

Grant SB[1], Saphores JD, Feldman DL, Hamilton AJ, Fletcher TD, Cook PL, Stewardson M, Sanders BF, Levin LA, Ambrose RF, Deletic A, Brown R, Jiang SC, Rosso D, Cooper WJ, Marusic I.

Author information

Abstract

Humans create vast quantities of wastewater through inefficiencies and poor management of water systems. The wasting of water poses sustainability challenges, depletes energy reserves, and undermines human water security and ecosystem health. Here we review emerging approaches for reusing wastewater and minimizing its generation. These complementary options make the most of scarce freshwater resources, serve the varying water needs of both developed and developing countries, and confer a variety of environmental benefits. Their widespread adoption will require changing how freshwater is sourced, used, managed, and priced.

PMID:
22879506
[PubMed - indexed for MEDLINE]

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Water Res. 2011 Aug;45(14):4238-47. doi: 10.1016/j.watres.2011.05.032. Epub 2011 Jun 7.

Bioanalytical tools for the evaluation of organic micropollutants during sewage treatment, water recycling and drinking water generation.

Macova M[1], Toze S, Hodgers L, Mueller JF, Bartkow M, Escher BI.

Author information

Abstract

A bioanalytical test battery was used for monitoring organic micropollutants across an indirect potable reuse scheme testing sites across the complete water cycle from sewage to drinking water to assess the efficacy of different treatment barriers. The indirect potable reuse scheme consists of seven treatment barriers: (1) source control, (2) wastewater treatment plant, (3) microfiltration, (4) reverse osmosis, (5) advanced oxidation, (6) natural environment in a reservoir and (7) drinking water treatment plant. Bioanalytical results provide complementary information to chemical analysis on the sum of micropollutants acting together in mixtures. Six endpoints targeting the groups of chemicals with modes of toxic action of particular relevance for human and environmental health were included in the evaluation: genotoxicity, estrogenicity (endocrine disruption), neurotoxicity, phytotoxicity, dioxin-like activity and non-specific cell toxicity. The toxicity of water samples was expressed as toxic equivalent concentrations (TEQ), a measure that translates the effect of the mixtures of unknown and potentially unidentified chemicals in a water sample to the effect that a known reference compound would cause. For each bioassay a different representative reference compound was selected. In this study, the TEQ concept was applied for the first time to the umuC test indicative of genotoxicity using 4-nitroquinoline as the reference compound for direct genotoxicity and benzo[a]pyrene for genotoxicity after metabolic activation. The TEQ were observed to decrease across the seven treatment barriers in all six selected bioassays. Each bioassay showed a differentiated picture representative for a different group of chemicals and their mixture effect. The TEQ of the samples across the seven barriers were in the same order of magnitude as seen during previous individual studies in wastewater and advanced water treatment plants and reservoirs. For the first time a benchmarking was performed that allows direct comparison of different treatment technologies and covers several orders of magnitude of TEQ from highly contaminated sewage to drinking water with TEQ close or below the limit of detection. Detection limits of the bioassays were decreased in comparison to earlier studies by optimizing sample preparation and test protocols, and were comparable to or lower than the quantification limits of the routine chemical analysis, which allowed monitoring of the presence and removal of micropollutants post Barrier 2 and in drinking water. The results obtained by bioanalytical tools were reproducible, robust and consistent with previous studies assessing the effectiveness of the wastewater and advanced water treatment plants. The results of this study indicate that bioanalytical results expressed as TEQ are useful to assess removal efficiency of micropollutants throughout all treatment steps of water recycling.

PMID:
21704353
[PubMed - indexed for MEDLINE]

>>

J Environ Manage. 2011 Oct;92(10):2447-53. doi: 10.1016/j.jenvman.2011.05.004. Epub 2011 May 31.

Potential fresh water saving using greywater in toilet flushing in Syria.

Mourad KA[1], Berndtsson JC, Berndtsson R.

Author information

Abstract

Greywater reuse is becoming an increasingly important factor for potable water saving in many countries. Syria is one of the most water scarce countries in the Middle East. However, greywater reuse is still not common in the country. Regulations and standards for greywater reuse are not available. Recently, however, several stakeholders have started to plan for greywater reuse. The main objective of this paper is to evaluate the potential for potable water saving by using greywater for toilet flushing in a typical Syrian city. The Sweida city in the southern part of Syria was chosen for this purpose. Interviews were made in order to reflect the social acceptance, water consumption, and the percentage of different indoor water uses. An artificial wetland (AW) and a commercial bio filter (CBF) were proposed to treat the greywater, and an economic analysis was performed for the treatment system. Results show that using treated greywater for toilet flushing would save about 35% of the drinking water. The economic analyses of the two proposed systems showed that, in the current water tariff, the payback period for AW and CBF in block systems is 7 and 52 years, respectively. However, this period will reduce to 3 and 21 years, respectively, if full water costs are paid by beneficiaries. Hence, introducing artificial wetlands in order to make greywater use efficient appears to be a viable alternative to save potable water.

PMID:
21621904
[PubMed - indexed for MEDLINE]