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Record 1 of 58

Author(s): Sanchez-Martin, J (Sanchez-Martin, J.); Beltran-Heredia, J (Beltran-Heredia, J.); Solera-Hernandez, C (Solera-Hernandez, C.)

Title: Surface water and wastewater treatment using a new tannin-based coagulant. Pilot plant trials

Source: JOURNAL OF ENVIRONMENTAL MANAGEMENT, 91 (10): 2051-2058 OCT 2010

Abstract: A new tannin-based coagulant-flocculant (Tanfloc) was tested for water treatment at a pilot plant level. Four types of water sample were treated: surface water (collected from a river), and municipal, textile industry (simulated by a 100 mg L-1 aqueous solution of an acid dye), and laundry (simulated by a 50 mg L-1 aqueous solution of an anionic surfactant) wastewaters. The pilot plant process consisted of coagulation, sedimentation, and filtration. The experiments were carried out with an average coagulant dosage of 92.2 mg L-1 (except in the case of the surface water for which the dosage was 2 mg L-1). The efficacy of the water purification was notable in every case: total turbidity removal in the surface water and municipal wastewater, about 95% dye removal in the case of the textile industry wastewater, and about 80% surfactant removal in the laundry wastewater. Filtration improved the removal of suspended solids, both flocs and turbidity, and slightly improved the process as a whole. The efficiency of Tanfloc in these pilot studies was similar to or even better than that obtained in batch trials.

Times Cited: 0

ISSN: 0301-4797

DOI: 10.1016/j.jenvman.2010.05.013

Record 2 of 58

Author(s): Lazareva, O (Lazareva, Olesya); Pichler, T (Pichler, Thomas)

Title: Long-term performance of a constructed wetland/filter basin system treating wastewater, Central Florida

Source: CHEMICAL GEOLOGY, 269 (1-2): 137-152 Sp. Iss. SI JAN 15 2010

Abstract: This study investigated the efficiency of a constructed wetland/filter basin (CW/FB) treatment system to improve the chemical composition of waste and surface waters. The system was constructed in closed phosphate mines used for clay settling and sand tailings. Monitoring was carried out for 18 months to evaluate the CW/FB performance under a variety of climatic conditions. Water samples were taken bimonthly To evaluate possible groundwater input into and water leaking out of the wetland 6 monitor wells were installed along the flow path and sampled monthly. In order to estimate the change ofwater chemistry along the wetland flow path, water samples along a transect were taken during the dry and rainy seasons. The samples were analyzed for PH, T, oxidation-reduction potential (ORP), conductivity, total dissolved solids (TDS), dissolved oxygen (DO), Fe(II), H2S, major anions, major cations, arsenic, fecal and total coliform. The study showed the following changes in water quality between the input and output: (1) Substantial decrease ofwater temperature (up to 10 degrees C); (2) Significant change in PH from about 9 to 6.5-7; (3) Negative ORP confirming the reducing conditions of the treatment system; (4) Substantial increase of H2S (UP to 1060 mu g/L); (5) Reduction of As from 5 to <2 mu g/L (mostly <0.5); (6) Substantial reduction Of SO4, F, Cl, NO3, NO2, Br, Na, K, Ca, and Mg: (7) Reduction of fecal and total coliform from 30-730 and 1000-7000 to <2 and <100 count/100 ml, respectively. In general, the performance of the CW/FB treatment system showed great potential to improve the water quality of industrial and municipal wastewater. Despite significant seasonal variations with respect to temperature, rainfall and humidity, the chemical/microbiological composition of the wetland output remained relatively constant.

Times Cited: 0

ISSN: 0009-2541

DOI: 10.1016/j.chemgeo.2009.06.006

Record 3 of 58

Author(s): Kubare, M (Kubare, Michael); Haarhoff, J (Haarhoff, Johannes)

Title: Rational design of domestic biosand filters

Source: JOURNAL OF WATER SUPPLY RESEARCH AND TECHNOLOGY-AQUA, 59 (1): 1-15 2010

Abstract: A biosand filtration (BSF) unit is an intermittently operated slow sand filter designed for household use. This paper reviews the practical application of BSF, identifies the important design considerations and proposes a systematic design procedure. The media properties, water requirements, filter cycle time and water temperature are identified as the most important design input parameters. The resultant specifications are the water dosage volume, water production rate and media bed dimensions. We propose two parameters for characterising the filtration rate, namely the initial and average clean bed filtration rate. Mathematical expressions for these two parameters and the filtration time are derived. Guideline values for the filtration rate and the ratio of the pore volume to

the water dosage volume are established and used as design checks. It is noted that the filtration rate is determined solely by the properties of the water temperature and the media-customary constraints posed by the bed area and the bed depth had been eliminated. Therefore the heart of BSF design lies in the careful and appropriate selection of the filter media. The design procedure proposed is illustrated with an example for a typical rural household in Venda, South Africa.

Times Cited: 0

ISSN: 0003-7214

DOI: 10.2166/aqua.2010.008

Record 4 of 58

Author(s): Langenbach, K (Langenbach, K.); Kuschk, P (Kuschk, P.); Horn, H (Horn, H.); Kastner, M (Kaestner, M.)

Title: Modeling of slow sand filtration for disinfection of secondary clarifier effluent

Source: WATER RESEARCH, 44 (1): 159-166 JAN 2010

Abstract: Due to increasing water scarcity, appropriate technologies are needed for disinfection of wastewater to enable safe reuse. Research on hygienisation of secondary effluent using slow sand filters is very limited but promising with removal of fecal indicator bacteria of >2 log-units. A quantitative description of the processes leading to bacteria removal is lacking and therefore a model was developed for E. coli removal from secondary clarifier effluent in slow sand filters. Removal was successfully simulated for sands of variable grain size distribution and under a range of hydraulic loading rates compared to data obtained at pilot-scale filters. The most important process was retention of bacteria at the "schmutzdecke" and sand surface leading to an enrichment by a factor of lip to 600 compared to the surrounding bulk phase. Bacteria elimination and inactivation both in the bulk phase and the schmutzdecke can be described by a first order kinetic.

Times Cited: 0

ISSN: 0043-1354

DOI: 10.1016/j.watres.2009.09.019

Record 5 of 58

Author(s): Anderson, WB (Anderson, William B.); DeLoyde, JL (DeLoyde, Jeffrey L.); Van Dyke, MI (Van Dyke, Michele I.); Huck, PM (Huck, Peter M.)

Title: Influence of design and operating conditions on the removal of MS2 bacteriophage by pilot-scale multistage slow sand filtration

Source: JOURNAL OF WATER SUPPLY RESEARCH AND TECHNOLOGY-AQUA, 58 (7): 450-462 NOV 2009

Abstract: This paper summarizes findings from sixteen MS2 bacteriophage (MS2) challenge tests on biologically mature pilot-scale slow sand filters, conducted at varying water temperatures (<10 degrees and >20 degrees C), two hydraulic loading rates (0.1 vs. 0.4 m/h), and two bed depths (0.4 vs. 0.9 m). Few studies have quantified virus removal by slow sand filters at filtration rates on the high end and bed depths on the low end of typical practice, and none report virus removal below 5 degrees C. The conditions investigated are important, because high filtration rates and low bed depths are sometimes seen as ways of making slow sand filtration more cost effective. MS2 removal increased with greater sand depth and warmer water temperature, but decreased at the higher hydraulic loading rate. Average MS2 removals ranged from 0.1 to 0.2 log in the roughing filters and 0.2 to 2.2 log in the slow sand filters. Shedding of MS2 was observed for up to 12 days after seeding was stopped. As a stand-alone process, slow sand filtration (with or without roughing filtration) may not provide adequate virus removal under some conditions and should be combined with a disinfection/inactivation step to provide robust compliance with regulatory requirements and protection of human health.

Times Cited: 0

ISSN: 0003-7214

DOI: 10.2166/aqua.2009.140

Record 6 of 58

Author(s): Langenbach, K (Langenbach, K.); Kuschk, P (Kuschk, P.); Horn, H (Horn, H.); Kastner, M (Kaestner, M.)

Title: Slow Sand Filtration of Secondary Clarifier Effluent for Wastewater Reuse

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY, 43 (15): 5896-5901 AUG 1 2009

Abstract: Appropriate technologies are needed for disinfection of wastewater to allow safe reuse. Slow sand filtration is a simple technology used for pathogen and particle removal in drinking water purification. We investigated removal of fecal indicator bacteria relevant for wastewater reuse, particle removal, and runtime in slow sand filtration of secondary clarifier effluent. The key process parameters hydraulic loading rate, sand grain size distribution, and filter bed depth were systematically varied. Slow sand filters for tertiary treatment of wastewater seem promising for wastewater reuse, especially in and developing countries. They eliminated 1.9-2.6 log(10)- units of E. coli and 1.9-3.0 log(10)-units of intestinal Enterococci reaching effluent concentrations of 11-142 CFU per 100 mL of E. coli and 2-24 CFU per 100 mL of intestinal Enterococci. Bacteria removal was shown to be a function of sand surface

area, dirt layer, and supernatant water. Sand surface area per filter surface area should not be chosen below 2000m(2)/m(2). Slow sand filters removed 70-84% of total suspended solids reaching effluent concentrations of 1.2-2.3 mg/L and turbidity levels of 0.5-0.8 NTU. Average runtime was between 59 and 148 days.

Times Cited: 2

ISSN: 0013-936X

DOI: 10.1021/es900527j

Record 7 of 58

Author(s): Park, WH (Park, W. H.); Polprasert, C (Polprasert, C.)

Title: Roles of oyster shells in an integrated constructed wetland system designed for P removal

Source: ECOLOGICAL ENGINEERING, 34 (1): 50-56 AUG 4 2008

Abstract: This research aimed to investigate the applicability of an integrated constructed wetland system for P removal from low-strength wastewaters. The integrated system consisted of a constructed wetland and a post-filter unit, in series; both units were packed with oyster shells (OS) as adsorption and filtration media. Based on 1 year of operation under the overall hydraulic retention time of 3.5 days, the integrated system was found to be highly effective in removing BOD5 (92.3%), N (85.7%). P (98.3%) and total suspended solids (TSS) (94.4%) compounds, in which the constructed wetland unit was responsible for most of the treatment performance, while the post-filter unit served as a polishing unit, especially in the removal of the remaining N, P and TSS. To simulate heavy rainfall conditions, the integrated system was tested under hydraulic shock loading at the overall hydraulic retention time of 0.7 day for 14 days that represented the extreme period of high drainage flows. There were some increases of P concentrations in the post-filter effluent during the 14 days of operation up to about 5 mg/l, but these P concentrations were later decreased to about 1 mg/L after the shock loading period. These experimental results suggested the applicability of the integrated constructed wetland system which used oyster shells as adsorption and filtration media for P removal which should help to minimize eutrophication problems in receiving waters. (C) 2008 Elsevier B.V All rights reserved.

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ISSN: 0925-8574

DOI: 10.1016/j.ecoleng.2008.05.014

Record 8 of 58

Author(s): Keraita, B (Keraita, Bernard); Drechsel, P (Drechsel, Pay); Konradsen, F (Konradsen, Flemming); Vreugdenhil, RC (Vreugdenhil, Reinout C.)

Title: Potential of simple filters to improve microbial quality of irrigation water used in urban vegetable farming in Ghana

Source: JOURNAL OF ENVIRONMENTAL SCIENCE AND HEALTH PART A-TOXIC/HAZARDOUS SUBSTANCES & ENVIRONMENTAL ENGINEERING, 43 (7): 749-755 2008

Abstract: Irrigation water used for growing vegetables in urban areas in many low-income countries is contaminated with untreated wastewater. Many wastewater treatment methods are economically prohibitive and continued use of such irrigation water pose health risks for vegetable consumers and farmers. As part of a larger study on possible interventions for health risk reduction, the potential of simple interventions was explored. Column slow sand filters with three levels of sand depths (0.5 m, 0.75 m and 1 m) and fabric filters made of nylon, cotton and netting were assessed. More than 600 water samples were analyzed for helminth eggs and thermotolerant coliforms. Flow rates were also measured. From slow sand filters, 71-96% of helminths and 2 log units (from 7 to 5 log units) of thermotolerant coliforms were removed. Sand depths had no significant influence in the removal. Lower removal rates were achieved by fabric filters, with an average removal of 12-62% for helminth eggs and 1 log unit for thermotolerant coliforms. Nylon filters had higher removal rates especially for helminth eggs (58%). Average flow rates for sand filters were 3 m per day and fabric filters had steady flows of about 1.5 liters per second, but flow reduced with time in cotton filters. The simple filters tested improved the microbial quality of irrigation water and could easily be used in combination with other interventions to further reduce health risks. The unit cost of the filters tested also appear acceptable to farmers and some incentives like better prices will motivate many farmers to invest in such simple interventions.

Times Cited: 2

ISSN: 1093-4529

DOI: 10.1080/10934520801959948

Record 9 of 58

Author(s): Lasage, R (Lasage, R.); Aerts, J (Aerts, J.); Mutiso, GCM (Mutiso, G. -C. M.); de Vries, A (de Vries, A.)

Title: Potential for community based adaptation to droughts: Sand dams in Kitui, Kenya

Source: PHYSICS AND CHEMISTRY OF THE EARTH, 33 (1-2): 67-73 2008

Abstract: This paper presents the results of an evaluation of the effects of a local water harvesting project in Kenya concerning the construction of small scale sand dams by communities. Sand dams are small structures built in ephemeral rivers to store excess water to overcome periods of drought. For this evaluation we developed a method using socio-economic vulnerability indicators, which are linked to the state water resources system, enabling the assessment of the impacts of changes in water management. Data for this evaluation was gathered by hydrological research and by interviewing local inhabitants during field research. It appeared that the sand dams have a large impact on the local community. In 10 years time, more than 100,000 people have better access to water through a relative low cost measure. The increased water availability, especially during dry periods, results in higher farm yields. The average income of farmers living near dams rose with 60%. The local water balance is almost not influenced as the sand dams store less than 3% of total yearly runoff. (c) 2007 Published by Elsevier Ltd.

Times Cited: 3

ISSN: 1474-7065

DOI: 10.1016/j.pce.2007.04.009

Record 10 of 58

Author(s): Mondal, PK (Mondal, Pulin Kumar); Seth, R (Seth, Rajesh); Biswas, N (Biswas, Nihar)

Title: Performance evaluation of fabric aided slow sand filter in drinking water treatment

Source: JOURNAL OF ENVIRONMENTAL ENGINEERING AND SCIENCE, 6 (6): 703-712 NOV 2007

Abstract: In this study, an assessment of the performance of slow sand filter (SSF) aided with non-woven fabric (NWF) was carried out. Several laboratory-scale SSF columns were tested with simulated raw water containing varying levels of turbidity and total organic carbon (TOC). The results show that in filters with NWF, the fabric layers captured most of the incoming solids and extended the filter run time for the sand bed. The run time for the sand bed increased with the increasing of the fabric thickness from 8.9 to 44.5 mm. Turbidity, TOC, and bacterial removal efficiencies of the filters with fabric were comparable to that without fabric and representing conventional SSF. The study thus demonstrates that operation of SSF with NWT can be a feasible option for simplifying the operation of and extending the viability of the SSF process to a wider range of raw water turbidity values than that considered economical for conventional SSF.

Times Cited: 0

ISSN: 1496-2551

DOI: 10.1139/S07-019

Record 11 of 58

Author(s): Campos, LC (Campos, Luiza C.); Smith, SR (Smith, Stephen R.); Graham, NJD (Graham, Nigel J. D.)

Title: Deterministic-based model of slow sand filtration. 1: Model development

Source: JOURNAL OF ENVIRONMENTAL ENGINEERING-ASCE, 132 (8): 872-886 AUG 2006

Abstract: Slow sand filtration (SSF) is widely used throughout the world for the treatment of drinking water. However, relatively little attention has been given to the development of a comprehensive process model. Previous studies have considered separate aspects of the SSF process, such as developing an improved representation of the schmutzdecke layer, and a more detailed description of the microbial dynamics. The objective of this work was to develop a deterministic simulation model of the SSF process incorporating fundamental physicochemical and biological dynamics within a classical filtration framework. The model was based on a temporal and spatial finite difference method and was calibrated and verified using operational data from pilot-scale SSF units. Results from the calibration showed that the model satisfactorily predicts headloss development in SSF units. There was no significant difference between many of the most sensitive model parameter values for two successive runs of the same filter. However, a few individual model parameters (e.g., in the fundamental headloss equations) were found to vary with filtration run and it is speculated that this is due to seasonal factors.

Times Cited: 4

ISSN: 0733-9372

DOI: 10.1061/(ASCE)0733-9372(2006)132:8(872)

Record 12 of 58

Author(s): Campos, LC (Campos, Luiza C.); Smith, SR (Smith, Stephen R.); Graham, NJD (Graham, Nigel J. D.)

Title: Deterministic-based model of slow sand filtration. II: Model application

Source: JOURNAL OF ENVIRONMENTAL ENGINEERING-ASCE, 132 (8): 887-894 AUG 2006

Abstract: This paper describes the use of a deterministic slow sand filter process model to investigate and assess some of the fundamental aspects and mechanisms operating during slow sand filtration (SSF). These include the role of the schmutzdecke. biomass development, and the initial condition of the filter, to the overall process performance. The SSF process model has been developed recently and is described in a companion paper by Campos et al., in 2006. It attempts to provide a Simulation of the physicochemical and biological processes responsible for the filtration mechanisms operating in SSF The simulation of filter runs has been carried Out with the help of extensive pilot plant data provided by Thames Water Utilities Ltd.. involving both uncovered and covered filter beds. The results demonstrate that the presence and nature of a schmutzdecke layer profoundly influence the spatial and temporal development of interstitial biomass within the sand and, consequently, the headloss profile. Microbial interactions in the filter bed play a fundamental role in the process and are involved in setting the pattern and magnitude of headloss development. The model also demonstrates the significance of residual deposits within the filter after surface cleaning, oil the Subsequent filter behavior.

Times Cited: 6

ISSN: 0733-9372

DOI: 10.1061/(ASCE)0733-9372(2006)132:8(887)

Record 13 of 58

Author(s): Taylor, M; Clarke, WP; Greenfield, PF; Swain, GJ

Title: Characterizing the physical and chemical properties of a vermicompost filter bed

Source: COMPOST SCIENCE & UTILIZATION, 12 (4): 383-391 FAL 2004

Abstract: Vermicompost filtration is a new on-site waste treatment system. Consequently, little is known about the filter medium properties. The aim of this preliminary study was to quantify physical and compositional properties of vermicompost filter beds that had been used to treat domestic solid organic waste and wastewater. This paper presents the trials performed on pilot-scale reactors filled with vermicompost from a full-scale vermicompost filtration system. Household solid organic waste and raw wastewater at the rate of 130 L/m(2)/d was applied to the reactor bed surface over a four-month period. It was found that fresh casts laid on the bed surface had a BOD of 1290 mg/g VS while casts buried to a depth of 10 cm had a BOD of 605 mg/g VS. Below this depth there was little further biodegradation of earthworm casts despite cast ages of up to five years. Solid material in the reactor accounted for only 7-10% of the reactor volume. The total voidage comprised of large free-draining pores, which accounted for 15-20% of the reactor volume and 60-70% micropores, able to hold up water against gravity. It was shown that water could flow through the medium micropores and macropores following a wastewater application. The wastewater flow characteristics were modeled by a two-region model based on the Richards Equation, an equation used to describe porous spatially heterogeneous materials.

Times Cited: 0

ISSN: 1065-657X

Record 14 of 58

Author(s): Clarke, BA; Jones, CJ; Evans, HL; Crompton, JL; Dorea, CC; Bertrand, S

Title: Multi-stage filtration for developing world surface water treatment

Source: PROCEEDINGS OF THE INSTITUTION OF CIVIL ENGINEERS-WATER MANAGEMENT, 157 (3): 143-149 SEP 2004

Abstract: Gravel pre-filters and slow sand filters are robust and reliable unit processes with the potential for broad small community application in the developing world as they are able to provide physical and microbiological treatment. A multi-stage system comprising gravel pre-filters, slow sand filters and terminal disinfection conforms with the multiple barrier concept in relation to pathogen removal. Employing upflow gravel pre-filters as a form of pretreatment also considerably reduces the risk of the slow sand filter blocking as a result of the surface straining of particles present in the raw water. The performance of a multi-stage treatment system, comprising shallow upflow gravel pre-filters and fabric-enhanced slow sand filters, was investigated both in service and during cleaning operations in a UK-based research project. The pre-filters provided microbial and physical treatment capacity and attenuated peaks in the raw water to the benefit of the slow sand filter. The slow sand filter achieved high levels of pathogen removal in addition to providing further physical treatment. The novel raised floor configuration adopted for the upflow pre-fliters enabled high cleaning efficiencies to be achieved by rapid draindown. In parallel with the research work, a multistage system was constructed at Nyabwishongwezi, Rwanda, to provide a supply for new communities settling in the northern section of the Akagera Game Park following the 1994 genocide and war. The Nyabwishongwezi Treatment Plant and Supply Network Project was promoted by the United Nations High Commissioner for Refugees, Oxfam and Minitrape, Rwanda. It was constructed broadly in keeping with the advice given to the parties promoting the project by the Centre for Environmental Health Engineering (CEHE), University of Surrey, during research visits to Rwanda in the late 1990s. In October 2003, CEHE research staff visited Nyabwishongwezi to support the Rwandan organisation (the Regie) operating the multi-stage plant and distribution system. The multi-stage system was found to be achieving substantial levels of microbial and physical improvement of the raw water obtained from the River Umuvumba.

Times Cited: 2

ISSN: 1741-7589

Record 15 of 58

Author(s): Weber-Shirk, ML

Title: Enhancing slow sand filter performance with an acid-soluble seston extract

Source: WATER RESEARCH, 36 (19): 4753-4756 NOV 2002

Abstract: An acid-soluble extract was obtained from Cayuga Lake (Ithaca, NY) seston and applied to slow sand filters at different application rates. Biological activity in the filters was inhibited with 3mM sodium azide. The filters were challenged with a synthetic raw water containing Escherichia coli. The Cayuga Lake seston extract (CLSE) fed filters removed up to 99.9999% of the influent coliforms while the control filter (no CLSE) removed 50%. Filter performance was correlated with the amount of CLSE applied to the filters. (C) 2002 Elsevier Science Ltd. All rights reserved.

Times Cited: 1

ISSN: 0043-1354

Record 16 of 58

Author(s): Campos, LC; Su, MFJ; Graham, NJD; Smith, SR

Title: Biomass development in slow sand filters

Source: WATER RESEARCH, 36 (18): 4543-4551 NOV 2002

Abstract: Microbial biomass development in the sand and schmutzdecke layer was determined in two full-scale slow sand filters, operated with and without a light excluding cover. A standard chloroform fumigation-extraction technique was adapted to routinely measure microbial biomass concentrations in the sand beds. Sand was sampled to a depth of 10 cm and schmutzdecke was also collected at the same random positions on the uncovered filter. Interstitial microbial biomass in the uncovered sand bed increased with time and decreased with sampling depth. There was a small accumulation of sand biomass with time in the covered filter, but no relationship was apparent between biomass concentration and depth in this filter. Schmutzdecke did not develop on the covered filter and was spatially highly variable in the uncovered condition compared to the consistent patterns observed in interstitial biomass production. It is speculated that microbial biomass in the sand of uncovered filters is largely related to carbon inputs from photosynthetic activity in the schmutzdecke and involves mechanisms that spatially distribute carbon substrate from the schmutzdecke to the sand. However, total organic carbon and dissolved organic carbon removals were similar in both filters suggesting that relatively small biomass populations in covered filters are sufficient to remove residual labile carbon during advanced water treatment and little further advantage to water purification and organic carbon removal is gained by the increased production of biomass in uncovered slow sand filter beds. (C) 2002 Elsevier Science Ltd. All rights reserved.

Times Cited: 13

ISSN: 0043-1354

Record 17 of 58

Author(s): Rooklidge, SJ; Ketchum, LH

Title: Corrosion control enhancement from a dolomite-amended slow sand filter

Source: WATER RESEARCH, 36 (11): 2689-2694 JUN 2002

Abstract: The associated decrease of pH in slow sand filters, due to CO2 conversion and biological activity, may produce effluent that is slightly corrosive to downstream distribution pipe material. This pilot study examined the use of a 3-cm crushed dolomite limestone media layer placed within the filter column of a slow sand filter to enhance effluent corrosion control by the introduction of beneficial dolomite dissolution products, without impacting turbidity removal efficiencies. Turbidity removal, calcium concentration, pH, conductivity, total hardness and alkalinity changes were calculated for the filter during a 60-day pilot study, and water chemistry values were used to estimate the changes of the saturation index (SI) throughout the filter run. Total hardness change through the filter was compared to change calculated by a derived equation for hardness using calcium concentrations to determine if the media was dissolving in stoichiometric proportions, and mineral service life in the filter was estimated using an assumption of stoichiometric dissolution at a constant flow rate. Effluent SI was raised an average of 30%, alkalinity was increased by 19%, and effluent pH averaged 7.7. Filter effluent complied with current turbidity regulatory requirements for the provision of potable water, and mineral service life was estimated between 7.5 and 9.5 years. (C) 2002 Elsevier Science Ltd. All rights reserved.

Times Cited: 5

ISSN: 0043-1354

Record 18 of 58

Author(s): D'Andrea, AF; Aller, RC; Lopez, GR

Title: Organic matter flux and reactivity on a South Carolina sandflat: The impacts of porewater advection and macrobiological structures

Source: LIMNOLOGY AND OCEANOGRAPHY, 47 (4): 1056-1070 JUL 2002

Abstract: Study of the flux and fate of reactive organic material (OM) within Debidue Flat, an intertidal sandflat in the North Inlet estuary. South Carolina. demonstrated that this coarse-grained deposit is a dynamic, open system that experiences rapid OM decomposition and exchange Of Solutes in the top 30 cut of the sediment column. The fluxes of reactive OM through Debidue Flat were high during all seasons (27-170 mmol C m(2) d(-1)) and were comparable to fluxes in muddy portions of the North Inlet estuary. Porewater decomposition products were N- and P-rich. the modeled reactivity of organic carbon undergoing decomposition was high (first-order rate constant. k = 0.02 d(-1)), and abundant extractable chlorophyll a was measured year-round; all properties were consistent with marine algal-derived Substrates. Porewater Solute profiles were controlled by advective flow that rapidly exchanged porewater with overlying waters to similar to25 cm depth on timescales of hours. Thus, these sandflats act like all unsteady "trickling bed filter." capturing or generating reactive organic particles, rapidly remineralizing OM. and recycling nutrients. Macrobiological structures within the flat altered the amounts and reaction rates of OM on various spatial and temporal scales. Relatively elevated OM decay rates were associated with the burrows of Callichirus major, a deep-burrowing thalassinid shrimp. Large stingray feeding pits accumulated fine grained OM, locally clogging the "trickling bed filter," and inhibiting porewater advection. As illustrated by Debidue Flat. intertidal sands call be sites of high OM flux and turnover and play an important role in biogeochemical cycling in estuarine systems.

Times Cited: 38

ISSN: 0024-3590

Record 19 of 58

Author(s): Ehret, DL; Alsanius, B; Wohanka, W; Menzies, JG; Utkhede, R

Title: Disinfestation of recirculating nutrient solutions in greenhouse horticulture

Source: AGRONOMIE, 21 (4): 323-339 MAY-JUN 2001

Abstract: Recirculating nutrient systems offer a good method to control nutrient leaching from greenhouses into the environment. However, the potential for the rapid spread of root diseases is the main hindrance to adoption of recirculating nutrient systems by the greenhouse industry. This review discusses and compares five broadly different methods of disease control in these systems, namely heat, filtration, chemical, radiation and biological control. Each has strengths and weaknesses, but all have been found to be effective in terms of pathogen control. Sterilization (heat, oxidizing chemicals, UV radiation) and membrane filtration methods are generally very effective, but may adversely affect beneficial microorganisms in the recirculated solution. Slow filtration and microbial inoculation methods are less disruptive of the microflora, but effectiveness may vary with the pathogen. Microbial inoculation holds the promise of very targeted disease suppression, but few products are commercially available.

Times Cited: 39

ISSN: 0249-5627

Record 20 of 58

Author(s): Weber-Shirk, ML; Dick, RI

Title: Bacterivory by a chrysophyte in slow sand filters

Source: WATER RESEARCH, 33 (3): 631-638 FEB 1999

Abstract: Bacterivory previously was shown to be responsible for significant removal of bacteria in slow sand filters. This research was designed to identify the responsible bacterivores and to evaluate their ability to remove a significant fraction of bacteria. A smalt (3-mu m diameter) chrysophyte was isolated from slow sand filter effluent. The ability of a pure culture of the chrysophyte to rapidly ripen a slow sand filter was demonstrated.; 1998 Elsevier Science Ltd. All rights reserved.

Times Cited: 5

ISSN: 0043-1354

Record 21 of 58

Author(s): McMeen, CR; Benjamin, MM

Title: NOM removal by slow sand filtration through iron oxide-coated olivine

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 89 (2): 57-71 FEB 1997

Abstract: A 16-month pilot study compared iron oxide-coated olivine (IOCO) with uncoated olivine and plain sand as a medium for slow sand filtration. Three columns, each containing one of the media, were fed water from one proposed and one existing water supply source, and the removal efficiencies of natural organic matter (NOM) in the columns were compared. Consistent with previous work, NOM removal (measured as dissolved organic carbon or UV254) was slight in both the sand-packed and olivine-packed columns. However, removal of NOM was dramatically better in the IOCO-packed column. This improved performance could be attributed to both more efficient adsorptive removal of NOM and greater bioactivity in the IOCO column. During the test period, there

was no indication that the absorptive capacity of the IOCO was approaching exhaustion, suggesting that the adsorption sites were being bioregenerated. The performance of the IOCO warrants further evaluation as a technique for removing disinfection by-product precursors, particularly in small systems.

Times Cited: 13

ISSN: 0003-150X

Record 22 of 58

Author(s): WeberShirk, ML; Dick, RI

Title: Biological mechanisms in slow sand filters

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 89 (2): 72-83 FEB 1997

Abstract: Particle and E. coli removal mechanisms in slow sand filters were investigated at bench scale. Sodium azide (an inhibitor of oxidative phosphorylation) caused appreciable reduction in particle and E. coli removal; this indicated biological removal mechanisms were significant. Bacterivory was identified as the biological mechanism principally responsible for bacteria removal. There was no evidence of significant particle removal by attachment to biofilms.

Times Cited: 26

ISSN: 0003-150X

Record 23 of 58

Author(s): OJHA, CSP; GRAHAM, NJD

Title: COMPUTER-AIDED SIMULATION OF SLOW SAND FILTER PERFORMANCE

Source: WATER RESEARCH, 28 (5): 1025-1030 MAY 1994

Abstract: Although the modelling of deep bed filtration has progressed considerably in recent years, almost no attention has been given to simulating the process of slow sand filtration. The exception, to date, is the work of Woodward and Ta (1988) who have attempted to simulate slow sand tilter performance via a simple, empirical headless model; however, this model is not deterministic in nature and cannot predict filtrate quality nor the spatial headless development with the filter. This paper describes the development and calibration of a computer-based numerical model based on assumed filtration coefficient and headless relationships. The model structure includes a simple representation of biomass development but ignores the possible influence (currently uncertain) of a Schmutzdecke-surface skin. It is concluded that the spatial and temporal headless development within the media bed can

Times Cited: 3

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Record 24 of 58

Author(s): FAROOQ, S; ALYOUSEF, AK; ALLAYLA, RI; ISHAQ, AM

Title: TERTIARY-TREATMENT OF SEWAGE EFFLUENT VIA PILOT-SCALE SLOW SAND FILTRATION

Source: ENVIRONMENTAL TECHNOLOGY, 15 (1): 15-28 JAN 1994

Abstract: In view of limited information available about the performance of actual size slow sand filtration as a tertiary process in sewage treatment a pilot scale study was conducted over a period of one year using the secondary treated effluent from North Aramco Wastewater Treatment Plant, Dhahran, at a flow rate of 0.16 m hr(-1) (2L min(-1)) to determine the process efficiency. Two sizes of local sand, i.e., effective size (ES) = 0.31, uniformity coefficient (UC) = 2.00; and ES = 0.56, UC = 1.64, were evaluated in terms of removal of major pollution parameters such as organic matter, micro-organisms and nutrients. Effective range of the filter depth was also investigated by conducting the experiments at three different depths of the sand bed, i.e., 135, 105, and 55 cm for each size of the sand. It was found that removals of BOD, COD, standard plate counts, nitrate, phosphate and sulphate vary from 79-92%, 40-60%, 88-93%, 17-30%, 8.3-84%, and 5-10%, respectively, at various sand depths for two different sizes of the sand.

Times Cited: 3

ISSN: 0959-3330

Record 25 of 58

Author(s): MALLEY, JP; EIGHMY, TT; COLLINS, MR; ROYCE, JA; MORGAN, DF

Title: THE PERFORMANCE AND MICROBIOLOGY OF OZONE-ENHANCED BIOLOGICAL FILTRATION

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 85 (12): 47-57 DEC 1993

Abstract: Pilot-scale studies were conducted to determine the effects of preozonation and water column biofilm support media on slow sand filtration. The performance of the enhanced slow sand filters was compared with that of the full-scale treatment facility at Andover, Mass., which uses preozonation and granular activated carbon to enhance its conventional processes. Preozonation and biofilm support were observed to have a positive influence on filter performance, transformation of natural organic matter, microbiology, and removal of biodegradable dissolved organic carbon (BDOC). The pilot filter with the media of a larger effective size, an ozone dose of 2 mg per mg of nonpurgeable dissolved organic carbon (NPDOC), and biofilm support produced removals of turbidity, NPDOC, W absorbance, and trihalomethane formation potential comparable to the full-scale facility. And the enhanced pilot filter produced a lower finished-water BDOC value than the full-scale plant. Thus, enhanced slow sand filters hold promise for utilities that must comply with the Surface Water Treatment Rule and future disinfection by-product rules.

Times Cited: 18

ISSN: 0003-150X

Record 26 of 58

Author(s): FOGEL, D; ISAACRENTON, J; GUASPARINI, R; MOOREHEAD, W; ONGERTH, J

Title: REMOVING GIARDIA AND CRYPTOSPORIDIUM BY SLOW SAND FILTRATION

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 85 (11): 77-84 NOV 1993

Abstract: Between September 1986 and May 1988 a study of an operating slow sand water filtration plant was undertaken to determine its efficiency in removing Giardia and Cryptosporidium from a source water. The limited quantified data demonstrated an average 93 percent removal of Giardia cysts by the filtration plant, with this protozoan being detected in only one of 35 unfiltered water samples. An average 48 percent of Cryptosporidium oocysts was removed. Cryptosporidium was detected in 46 percent of the filtered samples. These findings suggest that Cryptosporidium may not be adequately removed from a contaminated source water under very cold operating conditions or if the filtration plant does not comply with accepted design standards. Other variables studied were turbidity and total and fecal coliform bacteria.

Times Cited: 20

ISSN: 0003-150X

Record 27 of 58

Author(s): FAROOQ, S; ALYOUSEF, AK

Title: SLOW SAND FILTRATION OF SECONDARY EFFLUENT

Source: JOURNAL OF ENVIRONMENTAL ENGINEERING-ASCE, 119 (4): 615-630 JUL-AUG 1993

Abstract: This pilot-scale study comprises a one-year field evaluation of slow sand filtration as a tertiary treatment of secondary wastewater effluents using two different effective sizes of local sand. i.e. 0.31 and 0.56 mm, to find a simple advanced wastewater treatment method. The filter was operated at sand depths of 135, 105, and 55 cm, respectively. for each size of the sand, to determine the operational range of the sand depth. Secondary effluent from North Aramco Wastewater Treatment Plant (NAWTP) was applied at a hydraulic loading of 0.16 m/h. The filter consistently gave over 90% removal of turbidity for both sizes of the sand at various depths of the filter bed along with over 93% removal of total coliform bacteria. It was observed that the use of coarse sand resulted in longer duration of filter operation as compared to the fine sand for similar removal of turbidity and coliform, i.e., 84 days in the case of coarse sand compared to a maximum of 26 days for the finer sand. The development of the head loss in the sand media was extremely small during the initial period of the operation, which later increased exponentially with most of the head loss occurring in the top dirty surface of the filter, known as Schumtzdecke in German.

Times Cited: 7

ISSN: 0733-9372

Record 28 of 58

Author(s): CLUFF, CB

Title: SLOW SAND NANOFILTRATION TREATMENT FOR SECONDARY TREATED WASTE-WATER

Source: DESALINATION, 88 (1-3): 53-67 OCT 1992

Conference Title: 1992 BIENNIAL CONF OF THE NATIONAL WATER SUPPLY IMPROVEMENT ASSOC - DESALTING AND RECYCLING : MEETING TODAYS WATER CHALLENGES

Conference Date: AUG 23-27, 1992

Conference Location: NEWPORT BEACH, CA

Abstract: The subject of slow sand/nanofiltration of municipal wastewater is discussed. Results of testing in Phoenix, Tucson and Tempe, Arizona are given as evidence that this technique will provide a low salinity water suitable for many types of reuse. The slow sand filter is a gravity filter which utilizes biological processes to remove dissolved organics. Only the surface of the sand bed is disturbed when cleaned. The slow sand filter is an excellent prefilter to the nanofilter membrane reducing organic scaling. The nanofilter membrane reduces salinity and hardness nitrates, heavy metals and other pollutants as well as significant amounts of dissolved organics. The combination of slow sand/nanofiltration treats wastewater the way it needs to be treated in order to be either safely disposed of or reused without significant negative environmental impacts.

Times Cited: 0

ISSN: 0011-9164

Record 29 of 58

Author(s): COLLINS, MR; EIGHMY, TT; FENSTERMACHER, JM; SPANOS, SK

Title: REMOVING NATURAL ORGANIC-MATTER BY CONVENTIONAL SLOW SAND FILTRATION

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 84 (5): 80-90 MAY 1992

Abstract: This article evaluates the capacity of slow sand filters to remove natural organic matter (NOM) and organic precursor materials as quantified by dissolved organic carbon, UV absorbance, and trihalomethane formation potential from source waters with varying levels of NOM. Municipal facilities were sampled to provide baseline data and to evaluate the effects of two different filter cleaning techniques, normal scraping and harrowing, on NOM and particulate removal. Pilot-scale filter studies were conducted to evaluate the influence of two different flow rates on NOM removal, particulate removal, and filter biomass development.

Times Cited: 17

ISSN: 0003-150X

Record 30 of 58

Author(s): COLLINS, MR; EIGHMY, TT; MALLEY, JP

Title: EVALUATING MODIFICATIONS TO SLOW SAND FILTERS

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 83 (9): 62-70 SEP 1991

Abstract: Slow sand filtration may be not only the cheapest and simplest treatment process to operate and maintain but also the most efficient under appropriate circumstances. Limitations of conventional slow sand filters include significant reductions in filter run lengths should raw water turbidity and algal content exceed relatively low levels, poor organic precursor removals, and relatively long filter cleaning downtimes and ripening periods. This review article summarizes and evaluates modifications to slow sand filters that may address these limitations without compromising the simplicity of the treatment process.

Times Cited: 9

ISSN: 0003-150X

Record 31 of 58

Author(s): MONJOUR, L; VOLTA, C; UWECHUE, N; DELORENZI, G

Title: EVALUATION OF TRADITIONAL FILTERS FOR WATER-PURIFICATION IN BURKINA-FASO

Source: ANNALES DE LA SOCIETE BELGE DE MEDECINE TROPICALE, 70 (4): 311-315 DEC 1990

Abstract: Most tropical water springs are polluted with microbial agents such as faecal coliforms and streptococci, so for the present and the forseeable future, boreholes are considered to be the most appropriate system for reducing the bacterial contamination of water. However, from source to consumer, safe drinking water usually becomes polluted with faecial bacteria. This observation which calls into question the success of the International Drinking Water Supply and Sanitation Decade should stimulate efforts to provide a reliable means of water purification. The use of traditional filters prepared with sand, gravel and charcoal has been proposed but our results reveal that they give no guarantee for the purification of bacteria-polluted water.

Times Cited: 3

ISSN: 0365-6527

Record 32 of 58

Author(s): TANNER, SA; ONGERTH, JE

Title: EVALUATING THE PERFORMANCE OF SLOW SAND FILTERS IN NORTHERN IDAHO

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 82 (12): 51-61 DEC 1990

Times Cited: 6

ISSN: 0003-150X

Record 33 of 58

Author(s): LELAND, DE; DAMEWOOD, M

Title: SLOW SAND FILTRATION IN SMALL SYSTEMS IN OREGON

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 82 (6): 50-59 JUN 1990

Times Cited: 4

ISSN: 0003-150X

Record 34 of 58

Author(s): CHANG, YH; SHELDON, BW

Title: APPLICATION OF OZONE WITH PHYSICAL WASTE-WATER TREATMENTS TO RECONDITION POULTRY PROCESS WATERS

Source: POULTRY SCIENCE, 68 (8): 1078-1087 AUG 1989

Times Cited: 12

ISSN: 0032-5791

Record 35 of 58

Author(s): EIGHMY, TT; COLLINS, MR; SPANOS, SK; FENSTERMACHER, J

Title: MICROBIAL-POPULATION DISTRIBUTIONS AND BENZOATE MINERALIZATION KINETICS IN A MUNICIPAL SLOW SAND FILTER

Source: WATER SCIENCE AND TECHNOLOGY, 20 (11-12): 293-299 1988

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ISSN: 0273-1223

Record 36 of 58

Author(s): LETTERMAN, RD

Title: AN OVERVIEW OF FILTRATION

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 79 (12): 26-32 DEC 1987

Times Cited: 6

ISSN: 0003-150X

Record 37 of 58

Author(s): MCNAIR, DR; SIMS, RC; SORENSEN, DL; HULBERT, M

Title: SCHMUTZDECKE CHARACTERIZATION OF CLINOPTILOLITE-AMENDED SLOW SAND FILTRATION

Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 79 (12): 74-81 DEC 1987

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ISSN: 0003-150X

Record 38 of 58

Author(s): CLIVER, DO; NEWMAN, RA

Title: DRINKING-WATER MICROBIOLOGY

Source: JOURNAL OF ENVIRONMENTAL PATHOLOGY TOXICOLOGY AND ONCOLOGY, 7 (5-6): 1-& MAY-AUG 1987

Times Cited: 1

ISSN: 0731-8898

Record 39 of 58

Author(s): FOX, RD

Title: SPIRULINA, REAL AID TO DEVELOPMENT
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Record 40 of 58
Author(s): ELLIS, KV
Title: SLOW SAND FILTRATION AS A TECHNIQUE FOR THE TERTIARY-TREATMENT OF MUNICIPAL SEWAGES
Source: WATER RESEARCH, 21 (4): 403-410 APR 1987
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Record 41 of 58
Author(s): SEELAUS, TJ; HENDRICKS, DW; JANONIS, BA
Title: DESIGN AND OPERATION OF A SLOW SAND FILTER
Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 78 (12): 35-41 DEC 1986
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Author(s): CULLEN, TR; LETTERMAN, RD
Title: THE EFFECT OF SLOW SAND FILTER MAINTENANCE ON WATER-QUALITY
Source: JOURNAL AMERICAN WATER WORKS ASSOCIATION, 77 (12): 48-55 1985
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Record 43 of 58
Author(s): BELLAMY, WD; HENDRICKS, DW; LOGSDON, GS
Title: SLOW SAND FILTRATION - INFLUENCES OF SELECTED PROCESS VARIABLES
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Author(s): BELLAMY, WD; SILVERMAN, GP; HENDRICKS, DW; LOGSDON, GS
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Author(s): SLEZAK, LA; SIMS, RC
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Author(s): MCCONNELL, LK; SIMS, RC; BARNETT, BB
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ISSN: 0273-1223

Record 51 of 58
Author(s): LOGSDON, GS; FOX, K
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Author(s): ELLIS, KV
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Author(s): [Anon]
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