Heterogeneity of Rapid Sand Filters and Its Effect on Contaminant Transport and Nitrification Performance

Laboratory and full-scale experiments were conducted to investigate the development and effect of heterogeneity caused by filter media nonuniformity, biofilm, particles, precipitates, and gas bubbles in rapid sand filters used for drinking-water treatment. Salt tracer experiments were conducted in laboratory columns and in a waterworks, where a new tracer method for rapid sand filters was developed. Pore-water velocities and dispersivities were estimated by fitting an analytical solution to the measured breakthrough curves. Results of the column experiments showed an increase in average longitudinal dispersivity of more than 33% in the 116 h after the start of filtration with a constant pore-water velocity and a zero-order nitrification rate of 9 mgN=L=h. The full-scale experiments showed that the rapid sand filter was heterogeneous with pore-water velocities ranging from 2.2 to 3.3 m=h for the same inlet flow. A first-order nitrification reaction with spatially variable pore-water velocity could be interpreted as a zero-order reaction with a constant pore-water velocity. A model demonstrated that filter heterogeneity could result in higher filter outlet ammonium concentrations.

General information
State: Published
Organisations: Urban Water Engineering, Department of Environmental Engineering, Krüger Veolia Water Technologies, GreenFlex - BeCitizen
Contributors: Lopato, L. R., Galaj, Z., Delpont, S., Binning, P. J., Arvin, E.
Pages: 248-257
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Environmental Engineering
Volume: 137
Issue number: 4
ISSN (Print): 0733-9372
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.32 SJR 0.445 SNIP 0.619
Web of Science (2017): Impact factor 1.396
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.23 SJR 0.475 SNIP 0.827
Web of Science (2016): Impact factor 1.541
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.07 SJR 0.526 SNIP 0.792
Web of Science (2015): Impact factor 1.125
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 0.99 SJR 0.571 SNIP 0.736
Web of Science (2014): Impact factor 1.267
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.04 SJR 0.519 SNIP 0.854
Web of Science (2013): Impact factor 1.221
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.18 SJR 0.722 SNIP 0.905
Web of Science (2012): Impact factor 1.399
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.9 SJR 0.538 SNIP 0.631
Web of Science (2011): Impact factor 1.312
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.418 SNIP 0.619
Web of Science (2010): Impact factor 1.121
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.583 SNIP 0.804
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.738 SNIP 1.022
Scopus rating (2007): SJR 0.691 SNIP 0.883
Scopus rating (2006): SJR 0.68 SNIP 1.009
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.764 SNIP 1.065
Scopus rating (2004): SJR 1.033 SNIP 1.165
Scopus rating (2003): SJR 0.839 SNIP 1.222
Scopus rating (2002): SJR 0.806 SNIP 1.119
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.691 SNIP 1.174
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.959 SNIP 1.014
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.859 SNIP 1.1
Original language: English
Keywords: Filter, Pollutants, Nitrification, Sand, Salt tracer, Clogging, Salt, Heterogeneity, Porous media
DOIs: 10.1061/(ASCE)EE.1943-7870.0000321
Source: orbit
Source-ID: 276052
Research output: Research - peer-review › Journal article – Annual report year: 2011