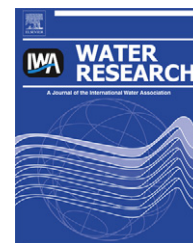




ELSEVIER

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.elsevier.com/locate/watres

Fate of dissolved organic nitrogen in two stage trickling filter process

Halis Simsek^a, Murthy Kasi^{a,b}, Tanush Wadhawan^a, Christopher Bye^c, Mark Blonigen^d, Eakalak Khan^{a,*}

^aDepartment of Civil Engineering, North Dakota State University, Fargo, ND 58108, USA

^bMoore Engineering, Inc., West Fargo, ND 58078, USA

^cEnviroSim Associates Ltd., Hamilton, Ontario L8P0A1, Canada

^dCity of Fargo Wastewater Treatment Plant, Fargo, ND 58102, USA

ARTICLE INFO

Article history:

Received 4 January 2012

Received in revised form

12 May 2012

Accepted 27 June 2012

Available online 14 July 2012

Keywords:

Biodegradable dissolved organic nitrogen (BDON)

Dissolved organic nitrogen (DON)

Total dissolved nitrogen (TDN)

Trickling filters

Wastewater

BioWin modeling

ABSTRACT

Dissolved organic nitrogen (DON) represents a significant portion of nitrogen in the final effluent of wastewater treatment plants (WWTPs). Biodegradable portion of DON (BDON) can support algal growth and/or consume dissolved oxygen in the receiving waters. The fate of DON and BDON has not been studied for trickling filter WWTPs. DON and BDON data were collected along the treatment train of a WWTP with a two-stage trickling filter process. DON concentrations in the influent and effluent were 27% and 14% of total dissolved nitrogen (TDN). The plant removed about 62% and 72% of the influent DON and BDON mainly by the trickling filters. The final effluent BDON values averaged 1.8 mg/L. BDON was found to be between 51% and 69% of the DON in raw wastewater and after various treatment units. The fate of DON and BDON through the two-stage trickling filter treatment plant was modeled. The BioWin v3.1 model was successfully applied to simulate ammonia, nitrite, nitrate, TDN, DON and BDON concentrations along the treatment train. The maximum growth rates for ammonia oxidizing bacteria (AOB) and nitrite oxidizing bacteria, and AOB half saturation constant influenced ammonia and nitrate output results. Hydrolysis and ammonification rates influenced all of the nitrogen species in the model output, including BDON.

© 2012 Elsevier Ltd. All rights reserved.

* Corresponding author. Department of Civil Engineering, North Dakota State University, Dept. # 2470, P.O. Box 6050, Fargo, ND 58108-6050, USA. Tel.: +1 701 231 7244; fax: +1 701 231 6185.

E-mail address: eakalak.khan@ndsu.edu (E. Khan).

0043-1354/\$ – see front matter © 2012 Elsevier Ltd. All rights reserved.

<http://dx.doi.org/10.1016/j.watres.2012.06.042>