Desalination and Water Treatment
www.deswater.com
doi: 10.1080/19443994.2014.880375

54 (2015) 15–27
April

Taylor & Francis
Taylor & Francis Group

Development of an ASM1 dynamic simulation model for an activated sludge process in United Arab Emirates

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Received 9 December 2012; Accepted 5 December 2013

ABSTRACT

The current study develops an ASM1-based dynamic simulation model for the activated sludge process of a major sewage treatment plant located in the United Arab Emirates. As a first step towards the model calibration and validation, two campaigns of field measurements and lab-controlled experiments were conducted to estimate a number of kinetic and stoichiometric parameters required by the ASM1 model. The first campaign was during the winter season with average temperature of 25°C and the second was during the summer season with average temperature of 39°C. Each campaign involved collection of composite samples at every hour for five consecutive days and analyzed for several variables including COD, BOD_5, SS, VSS, TOC, TN, TKN, NH_4-N, NO_3-N, and NO_2-N. Parameters for reaction kinetics and stoichiometry were determined based on winter measurements using respirometry techniques recommended by different studies. The paper reports the values of these parameters in addition to results of the dynamic calibration of ASM1 conducted using GPS-X simulation environment. A steady-state simulation was first conducted to fit the modeled sludge production to the sludge production calculated from plant average data collected during the measurement campaign. The model validation was conducted considering summer measurements after modifying a number of temperature-dependent parameters. The results indicated reasonable agreement between the measured and simulated effluent variables of COD, TSS, and NH_4-N.

Keywords: ASM1; Parameter estimation; Model calibration

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