

Università degli Studi di Napoli Federico II



Dipartimento di Ingegneria Civile, Edile e Ambientale

Classe delle lauree in Ingegneria Civile e Ambientale, Classe n° 35.
Corso di Laurea Magistrale in Ingegneria per l'Ambiente e Il
Territorio

Elaborato di Laurea

***Mathematical modelling of wastewater treatment processes with
operational control data***

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M67/312

Anno Accademico
2017/2018

ABSTRACT

Mathematical modelling and computer simulation have become a useful tool in evaluating the operation of wastewater plants (WWTPs) in terms of nutrient removal capability. In this study the developed model for the wastewater treatment plant of Ilhavo, in Aveiro, Portugal is described and the results of the steady-state simulation are discussed. The model of the plant was based on the state of the art Activated Sludge Model No. 1 (ASM1) combined with the Takács model for the secondary clarifier and was implemented in the WEST® Software. This software has a clear-cut graphical interface and uses a specialized translator that converts the graphical process into material balance equations. The focus of this work was to evaluate the applicability of the conventional construction and operation data of the plant for modelling and simulation. For the modelling of the process, it was necessary to collect historical data related to the Ilhavo WWTP performance over the last 3 years. The annual average values of conventional parameters, such as COD, Total Suspended Solids were used as input for the influent characterization and as output values to achieve the treated effluent characterization. Since the first simulation did not lead to the desired output results, it was necessary to proceed to the model calibration. During this step, the default values of only four model parameters were changed. Furthermore, these simulations have been validated with two different time periods. The results illustrated that the Ilhavo WWTP data obtained is not good enough to build up model, more in-depth knowledge of the characterization of the influent is needed. The opportunities for further applications of the plant model are discussed.

Keywords: wastewater treatment; model calibration; mathematical modelling; ASM1, COD fractions; WEST.