Mathematical Analysis and Numerical Simulations of a Functional Differential Model of a Biological Digestion Process

Milen Borisov[1], Neli Dimitrova[1], Mikhail Krastanov[1,2]
[1] Institute of Mathematics and Informatics
Bulgarian Academy of Sciences
milen_kb@math.bas.bg
[2] Faculty of of Mathematics and Informatics
Sofia University

In this talk we investigate a bioreactor model for wastewater treatment by anaerobic digestion. The model equations involve discrete delays, describing the time delay in nutrient conversion to viable biomass. Using a properly chosen admissible value for the dilution rate D we prove the global convergence of the solutions towards an equilibrium point, corresponding to D [1]. We also apply a numerical model-based extremum seeking algorithm for stabilizing the system towards the equilibrium point in which the maximum biogas (methane) flow rate is reached.

Numerical simulations are included to confirm the theoretical results. The simulations are implemented in the simulation software environment SmoWeb [2].

References

[1] Milen K. Borisov, Neli S. Dimitrova, Mikhail I. Krastanov, *Functional differential model of an anaerobic biodegradation process*, Large-Scale Scientific Computing, 10th International Conference, LSSC 2015, Sozopol, Bulgaria, June 8-12, 2015, pp. 101-109, ISBN 978-3-319-26519-3

[2] *SmoWeb*, SysMo, Ltd., Bulgaria, http://platform.sysmoltd.com, Accessed: April 2015.