A. Szaja[1], G. Łagód[1], J. Drewnowski[2], F. Sabba[3]

BIOAUGMENTATION OF A SEQUENCING BATCH REACTOR WITH ARCHAEA FOR THE TREATMENT OF REJECT WATER

[1] Lublin University of Technology, Poland;
[2] Gdansk University of Technology, Poland;
[3] University of Notre Dame, Department of Civil and Environmental Engineering and Earth Sciences, USA
g.lagod@pollub.pl

In this study, the bioaugmentation of a sequencing batch reactor (SBR) for the treatment of reject water from wastewater treatment plant was evaluated. For the bioaugmentation step a product containing an enrichment of microorganisms from the Archaea domain was used to enhance the performance of the reactor for treating reject water. The experiment was carried out in two parallel lab-scale sequencing batch reactors. The first one (SBR A) was bioaugmented with a suspension of microorganisms from the Archaea domain, while the second reactor (SBR B) was not bioaugmented. The results here presented show that the SBR technology could sustain efficient NH_4^+-N and chemical oxyden demand removal rates and can be applied for the treatment of reject water. Moreover, the addition of microorganisms belonging to the Archaea domain improved the SBR overall operation, especially when the loading in the influent was increased. Administering Archaea to the reactor had also a positive effect on ammonia oxidation as well as on the nitrite removal.

Keywords: reject water, bioaugmentation, sequencing batch reactor wastewater treatment plant, Archaea.

Introduction

Over the last few decades, wastewater treatment strategies have mostly focused on the process efficiency. Additionally, with the improvement of the effluent quality the amount of wastewater treatment by-products, i.e. sewage sludge, have also significantly increased [1, 2]. Generally, the sewage sludge treatment includes physical-chemical and biological methods, where the solid phase is separated from water. The most common applied processes are: thickening, anaerobic digestion, chemical conditioning, and dewatering

[29] Park H.D., Wells G.F., Bae H., Criddle C.S., Francis C.A. // Appl. Environ. Microbiol., 2006, vol. 72 (8), P. 5643 – 5647.
[30] Park H.D., Wells G.F., Bae H., Criddle C.S., Francis C.A. // Ibid, 2006, vol. 72. P. 5643 – 5647.
[31] Youa I., Dasa A., Dolanb E., Hu Z. // Water Res., 2009, vol. 43, P. 1801 – 1809.
[32] Van der Wielen P., Voost S., van der Kooij D. // Appl. Environ. Microbiol., 2009, vol. 74, P. 4687 – 4695.
[33] Zhang L.M., Hu H.W., Shen J.P., He J.Z. // ISME J., 2012, vol. 6, P. 1032 – 1045.
[34] Woś P., Dyka M., Korniluk M., Łagód G. // Proc. ECOpole, 2007, vol. 1, P. 277 – 281.
[35] Jaromin-Gleń K., Babko R., Łagód G., Sobczuk H. // Ecol. Chemi. and Eng. 2013, 20(1), P. 127 – 139.
[36] Supura E.V., Demchina V.P. // Proc. of XX Int. Conf. "Ecol. and Technical. Safety. Protection of water and air. Waste Disposal", 2012, P. 176 – 183.
[37] Lackner S., Lindenblatt C., Horn H. // Chemi. Engi. J., 2012, vol. 180, P. 190 – 196.
[38] Jenicek P., Svehla P., Zabranska J. Reject water treatment by nitritation / denitritation process – influence of ammonia concentration and loading rate. – Режим доступа: http: //www.bvsde.paho.org/bvsaar/cdlodos/pdf/ rejectwater683.pdf.
[39] Berends D.H.J.G., Salem S., van der Roest H.F., van Loosdrecht M.C.M. // Water Sci. and Technol., 2005, vol. 52, P. 63 – 70.
[40] Guz Ł., Łagód G., Jaromin-Gleń K., Suchorab Z., Sobczuk H., Bieganowski A. // Sensors, 2015, vol. 15, P. 1 – 21.
[41] Babko R., Jaromin-Gleń K.M., Łagód G, Pawcowska M., Pawłowski A. // Desalination and Water Treatment, 2016, vol. 57, P. 1490 – 1498.

Recieved 23.12.2015