

**Brzezinska, A., Zawilski, M. Dynamic Modeling of the Biological Treatment Process for Combined Wastewater: A Case Study. *Ochrona Srodowiska* 2010, Vol. 32, No. 3, pp. 21–26.**

**Abstract:** Problems inherent in the biological treatment of combined wastewater in the city of Lodz were examined by computer simulation and by analyzing the results of the authors' own studies. Detailed consideration was given to the variations in the temperature and composition of the combined wastewater during wet weather periods. During runoff caused by such meteorological phenomena as storm, rainfall or melting snow the composition of the wastewater is constantly changing, which adversely affects the stability and efficiency of biological treatment. Of particular concern is the excessive dilution of the wastewater stream, as this largely reduces the quantity of the readily biodegradable carbon source, an important contributor to the course of the treatment process. The results of a previous study have shown that the fractional composition of COD and total nitrogen (TKN) is a decisive factor in the modeling of the biological treatment process. In the present study the process was analyzed for the response to the variations in the particular fractions of the two parameters. The variations in the values of these fractions were related to those in the real quality parameters of the raw wastewater entering the Group Wastewater Treatment Plant in Lodz over a dry weather period. It has been demonstrated that the variations in the fractional composition of the combined wastewater pollutants – when related to the wastewater entering the treatment plant during dry weather – generally have a limited impact on the quality of the treated water. In some instances, however, these variations may exert a notably adverse effect on the COD and TKN values. In the case of nitrogen, this unfavorable effect is also attributable to the drop in the wastewater temperature in the winter season.

**Keywords:** Combined wastewater, biological treatment, modeling, dry weather, wet weather, temperature, COD, TKN.